THE ELECTRICAL WORLD

A Weekly Review of Current Progress in Electricity and its Practical Applications

VOL. II.—No. 8. NEW YORK, OCTOBER 20, 1883 —TWENTY-FOUR PAGES. $2 PER ANNUM. 5 CENTS A COPY.

The Exhibits at the Telephone Convention.

The fourth annual telephone convention, held at Cincinnati this week (Oct. 16 and 17), and of which a full report is given in another column, was made an occasion for exhibits of telephonic apparatus and appliances of all descriptions, as in previous years. Quite a number of those engaged in the manufacture or sale of telephonic apparatus and supplies improved this excellent opportunity to come in contact with their customers by a display of their products. The well-known firms whose exhibits we noted at the previous conventions exhibited as a matter of course, to show their patrons that they are not lagging behind in the march of improvement, and the rest appeared on the scene as new competitors for patronage. Of course all strove to emulate by presenting the latest and the best in the line of invention and improvement. The result was of necessity a fine exhibition, fully equal in point of excellence to those of the preceding conventions, as was amply shown by the eager interest which it excited in all those present.

As these exhibits embody in a measure the progress which has been realized in the art during the year preceding, they are of interest to all who follow the industrial development of this useful application of electricity, and for this reason we feel sure that the readers of THE ELECTRICAL WORLD will appreciate our effort to present a complete review of these exhibits.

The meeting room of the convention was on the parlor floor of the Gibson House, and the exhibits were placed in rooms adjacent to this.

WESTERN ELECTRIC COMPANY.

The Chicago factory, the Indianapolis (Gilliland) factory, and the Boston (Williams) factory of the Western Electric Co. each contributed its line of goods, which formed together the exhibit of this company, all three groups being placed in the same room.

The chief novelty in this exhibit was undoubtedly the "multiple switch-board system," now attracting so much attention from telephone exchanges on account of the success which has followed its adoption by several of the leading telephone exchanges in the country during the past year. Fig. 1 represents one of these multiple switch-boards for an exchange of 1,200 subscribers. It has 1,200 switch openings or "spring jacks," one corresponding to each line. The connections between the spring jacks are made in a manner nearly identical to that of the switch-board, described in our leading article of Sept. 29, ult., on "The Telephone in Switzerland," which switch-board, by the way, is manufactured under the Western Electric Company's patents. The connecting plugs are in pairs and hang down from the upper or projecting portion of the switch-board, and the weighted pulleys which stretch the connecting cords are disposed above instead of below the spring jacks. The two plugs of each pair are placed in front of each other, so that only one is seen in the figure. It will be seen that there are thirty pairs numbered from one to thirty, and to each pair corresponds a clearing out annunciator. Instead of pulling the plug up, it is pulled down, to make connection. Any pair may be used to make the connections. Thus, for instance, the pair No. 9 connects a spring jack in the second block of a hundred with a spring jack in the twelfth, as shown by the dark lines, which represent the connecting cords. For each pair of plugs there is a switch lever on the projecting table-leaf below, and to each set of five pairs is a set of calling keys. Although each and every line centering in the exchange has a spring-jack in the switch-board, yet the two operators placed in charge of it are not expected to answer the calls for the whole 1,200 subscribers. That would be impossible, at least with such impatient and fidgety patrons as the average telephone subscribers are. Each switch-board is intended to accommodate only 200 subscribers. In an exchange of 1,200, six switchboards like that shown in Fig. 1 would be required. The reason why the spring jacks are "multiplied" to such an extent on each switch-board will appear presently. The spring jacks (Fig. 2) are of the ordinary description used in the standard switch-board, except that the spring is insulated from the frame of the jack, and the connection is also made by inserting a plug which opens the connection between the phosphor bronze spring and the insulated screw, as shown in Fig. 3. The spring jacks are mounted on bases, and form blocks or sections of one hundred (5 × 20), the section being 15 inches long and 5 inches wide. The sections may be removed independently of each other, and new ones may be added at the top as the exchange grows.

The spring jacks are numbered from 1 to 1200 in each of the six switch-boards, and all those of the same number are connected together. Thus the line *A* (Fig. 4), passing through the lightning arrester, goes to the spring of the jack of the first switch-board and from the insulated screw to the spring of the jack bearing the same number on the next switch-board, and from this to the corresponding one on the next, and finally, after passing through all of the same number, at every switch-board (three being shown in Fig. 4), it goes to the annunciator, and to the ground.

On the first switch-board, the annunciators corresponding to the first two hundred numbers are placed. The next table receives the annunciators of Nos. 201 to 401, the next 401 to 601, and so on. Thus the two operators at each switch-board only become cognizant of calls made by 200 subscribers, corresponding to the annunciators on their switch-board. It makes no difference on which switch-board the annunciators are placed, provided they are placed between the *last* spring jack and the ground, because the subscriber's line affords practically six points of connection—one for each switch-board, and the operator can evidently use the spring jack of the number corresponding to the annunciator, no matter at which switch-board the latter is placed. The advantage of the multiple switch-board is now plainly seen.

Each operator takes special charge of one-half the

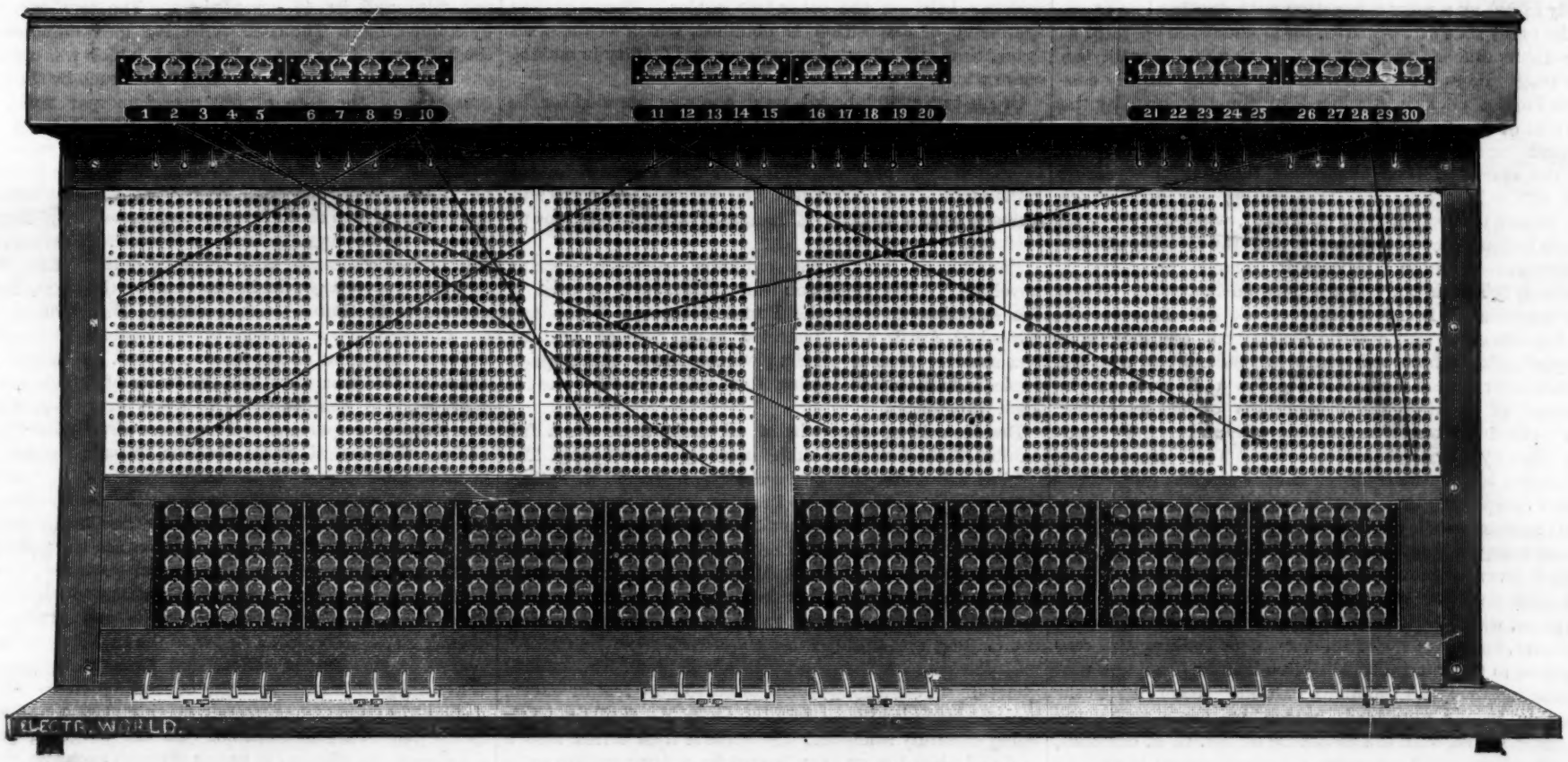


FIG. 1.—THE MULTIPLE SWITCH-BOARD.

(Exhibit of the Western Electric Company.)

switch-board, or 100 of the annunciator numbers and their corresponding spring jacks. Now, when she receives a call from any of the subscribers in her charge, she can connect them by using a pair of plugs, not only with any other on her section of spring jacks, but with any other of the 1,200 subscribers without assistance, no matter on what table the latter may be specially accommodated, and likewise an operator on another switch-board can connect with one of her subscribers without even her knowledge. This system dispenses with all necessity of repeating calls from one switch-board to the other.

But, as several subscribers on different sections might desire to be connected with the same subscriber at the same time, it is necessary for each operator to have a means of determining whether any plug has been inserted in the spring jack of this number on any of the other six switch-boards, and a special test is provided for the purpose.

It is for providing this test that the springs of the jacks are insulated from the frames, and that the frames themselves, moreover (Fig 4), are connected together, a line (*B*(passing from the frame of one spring to the frame of the corresponding jack on the other switch-boards. Suppose that subscriber 205 on her section wants 673. As soon as the annunciator drops, the operator pulls down the front plug of any pair and inserts it into the spring jack. By so doing she cuts off the annunciator and literally prolongs the subscriber's line into the connecting cord which completes a circuit to the other cord and to the rear plug of the same pair, whose upper end forms metallic connection with the ground strip. In passing from one cord to the other, however, the line may be made to include the operator's apparatus. The telephone apparatus is normally included in this loop whenever the switching lever corresponding to the pair of plugs is forward. The operator's telephone circuit also comprises a cell of battery for the test. Having ascertained the number required (673) by the calling subscriber (205), she takes down the rear plug of the same pair, thus opening the circuit between the first subscriber and her telephone, and while listening at the telephone she places the end of this plug in contact with the metallic portion of spring jack 673, with which she is about to make connection.

The metallic portions of all spring jacks numbered 673 are connected together as just seen, and if this line is already in use by a prior connection with another line at one of the other six switch-boards, the moment the operator at this table touches the metallic portion of 673 with the rear plug a cross is formed with the circuit already connected and a click is produced in the telephone by the current of the single cell. In such a case the operator informs subscriber 205 that 673 is busy. If no click is heard by the operator, then she inserts the plug into spring jack 673 and depresses the right calling key, after which she throws the switch lever backward, whereby the telephone becomes cut out of circuit and the clearing out annunciator substituted. In case it becomes necessary to summon 205 again the left key may be depressed. When the conversation is ended either of the subscribers sends an impulse of current and the clearing out annunciator is dropped, after which the plugs are pulled out and the switch lever turned forward. Fig. 5 is a diagram of the manner of making the connections of the telephone, the clearing out annunciators and the calling battery or generator. The two cords are connected to the calling keys, and the clearing out annunciator completes the circuit between the two upper contacts against which these keys normally rest, the telephone circuit being in a derived branch, which is closed when the switch lever is thrown forward while the lower contacts are connected with the generator and the ground. This diagram, which is reproduced from the catalogue, does not, however, represent the exact method of making the connections in the two multiple switch-boards forming a part of the company's Cincinnati exhibit. According to the diagram in our note book, which we made under the supervision and with the assistance of Mr. C. E. Scribner, one of the principal inventors, the arrangement is slightly different and constitutes an improvement. The switching lever presses down a vertical pin, which pushes down the contact spring. This spring is made double and the two sections are insulated from each other, and the connecting cords are connected with these sections instead of with the calling keys as in Fig. 5. When the switch lever is thrown forward the two sections of contact springs each touch on a contact, each contact leading to one of the calling keys. Between the upper contacts of the calling keys is looped the telephonic apparatus with the test cell, instead of the annunciator shown in Fig. 5. The lower contacts are connected to the generator and the ground as in Fig. 5. It is seen that by this arrangement the telephone forms a loop in the circuit between one plug and the other, when the contact keys are not depressed and the switching lever is thrown forward. When the switching lever is thrown backward the contact springs open the circuit to the calling keys, so that it is impossible to interrupt the subscribers either with the operator's telephone or the calling battery, while at the same time the contact springs come up against other contacts which close a circuit through the annunciator. In this way a pair of calling keys may be made to do the work for several pairs of connecting cords, since the connecting cords are only connected to the calling keys when the lever is thrown forward. The arrangement shown in Fig. 5 requires a pair of calling keys for each pair of cords. Fig. 1 shows only one pair of calling keys to every five connecting cords and switch levers.

A simple method of locating faults has been devised which is worthy of mention. If the frame of a spring jack becomes connected accidentally with the line, the line is always apparently "busy." The line is opened at a convenient point, say at the lightning arrester (Fig. 6). Now a rubber plug is inserted at one of the spring jacks in one of the switch-boards, and the click test tried at that jack. If the trouble is there and nowhere else the insertion of the rubber plug at that board and the breaking of the line connection will clear the cross connection and click previously produced, and the line will show "not busy." If the trouble is not cleared, then some other jack is at fault. On inserting the plug in another jack another test may be made, and thus finally the fault can be located. If, however, the test at every switch-board should still fail to locate the trouble, the probable cause is that the rubber bushing which insulates the contact screw of the jack is at fault. But the quality of rubber used and the care used in construction leave no possibility for the failure of this insulation.

Another interesting feature presented by this switch-board is the method of arranging the wires in cables. Behind these are vertical boards between the sections, and the cables, containing twenty wires, enter and leave through perforations in the boards. The diagram (Fig. 7) shows a cross section of one of these vertical boards. The first board has only one set of holes, through which the cables enter. Each cable gives off a wire to a spring jack, which, as we have seen in Fig. 1, are arranged in rows of twenty. From each spring jack starts the test line which is destined to connect the frames of the corresponding jacks in all the switch-boards, and the line out. These test lines are made of office wire of a uniform color and cabled together, and pass out through a hole in the next vertical board, thence to the wire conduit leading to the other switch-boards. The line out from each spring jack is cabled also with that of the others in the same row, and of another uniform color, and it also passes out through one of the holes in the vertical board separating the sections of spring jacks. The "lines in" of the same row of the next section enter in cable form through an opening midway between the other two cables. Thus a perfect symmetry of disposition is obtained, which economizes space, time and affords convenience and facility in making connections.

Of the two switch-boards used one was intended for the Baltimore (Md.) exchange and equipped for 1,600 subscribers, though it could be fitted for 4,900 if the business increased to that extent. The other was intended for the Indianapolis (Ind.) exchange and equipped for 1,200 subscribers, with a capacity of increased accommodations up to 2,400.

The Chicago branch also exhibited several interesting novelties. A double Edison transmitter, such as used in the experiments over the Postal Telegraph Company's wires last April, and illustrated in our issue of April 28, was shown. Also a quadruple transmitter with a quadruple induction coil having four primary coils, one for each transmitter.

Besides coils of office wire of all kinds, there was a full exhibit of the Patterson cables made by this company. The exhibit was under the special charge of Mr. W. R. Patterson, who is evidently at home in cable matters. He showed us a case containing 76 samples of as many types of cables for aerial, subterranean and submarine telegraph or telephone uses. The cables differ according to the purpose to which they are adapted. In making the cable the wires are covered with two or more windings of cotton or jute, thoroughly dried and saturated with paraffine, and the cable is then drawn into lead pipes. The cable is generally in continuous sections up to 1,500 feet in length, and the lead pipe in sections of 75 to 100 feet, the joints being carefully soldered. The cable is then coiled into a reel and placed in an oven heated to a temperature varying between 140° and 180° F., the melting point of the best paraffine, which is the material used for filling the pipe. The melted paraffine is charged with carbonic acid gas, made in a generator similar to those used for making soda water. The melted paraffine is then forced into the lead tubes. The presence of gas intimately mixed with the paraffine is advantageous in many respects. The gas forces the paraffine into every joint and reveals all defects in the pipe, while by its expansion it prevents the natural shrinkage of the paraffine, and obviates cracks and fissures that admit water when any accident occurs to the cables. It is claimed also that the admixture of gas in the paraffine makes it of lower inductive capacity by as much as 15 per cent., and that in this way wires of smaller diameter and higher resistance can be used without introducing too much retardation, the retardation of such a conductor, of 200 ohms resistance per mile, being no greater than with a conductor of 100 ohms per mile insulated with the same thickness of rubber or gutta percha, and provided with anti-induction covering of tin foil. With equal weight of conductors and equal thicknesses of insulations it is claimed that if the rubber insulated cable works over two miles, the Patterson cable will work over three miles. The use of small wire is also attended with less trouble from the static induction produced by one wire over the others, and the nearness of the wires and the large number used makes them act as anti-induction coverings for each other, while the small carrying capacity of fine wires would, in case of lightning discharge over a cable unprovided with lightning arrester, cause the wires to be burned off close to the end of a pipe, permitting the repairs to be made with greater ease. For telegraphic purposes the cables contain from 1 to 20 copper wires varying from No. 6 to No. 19, and for telephonic purposes from 1 to 320 wires varying from No. 22 to No. 26. The lead tube answers the purpose of an induction shield, but where additional provision is needed a large wire is placed in the centre of the cable as shown in Fig. 8. When the cables are to be submerged under water they are protected by a suitable armor of iron wires (Figs. 9, 10) placed over the lead tube, but for burying underground or placing in conduits the simple lead covering answers every purpose (Fig. 11). Mr. Patterson showed us samples of his cables which have been dug out and damaged by shovels, pick-axes, etc., and the structure of the cable, as revealed by the damaging blow, is very satisfactory and uniform. Mr. Patterson is also the inventor of a pole box (Fig. 12) which is used wherever cables connect with pole lines, as for instance at river crossings. The box contained fifty terminals and lightning arresters, and its general principle of construction will be understood from the figure. The wires are led out through holes in rubber strips on the end of the pipe, being thus separated for some distance from the end of the pipe, preventing capillary attraction between the strands, which diverge from each other. A smaller type of cable terminal for 20 wires was also shown. In this case the end of the cable fits into the small end of a funnel-shaped receiver, the larger end of which is covered by an india rubber disc having 20 binding posts, each of which is connected with one strand of the cable and serves to make connection with a telegraph line coming from the first pole. In order to demonstrate publicly the high degree of insulation afforded by the Patterson cables, Mr. Patterson had included a measuring apparatus in his exhibit. A cable of 50 strands No. 26 wire one-sixteenth of a mile long was the subject of the test. One strand only was connected to the testing battery composed of 50 cells chloride of silver elements, the other 49 strands being connected together so that the results would indicate the leakage between the one wire and its 49 companions. The test was made by connecting a Thomson reflecting galvanometer with the battery and the line to be tested, which was opened at one end. The insulation resistance indicated by the deflection was at the rate of 800 megohms per mile. The testing apparatus, which was exhibited by the New York factory, deserves special mention on account of its excellence. The Thomson galvanometer was made portable by being provided with a mechanical extension apparatus, which could be stretched out to any desirable distance for holding the lamp and scale. The necessary shunts and rheostats also accompany the outfit, which is equal in every particular to that of the best London makers, so Mr. Patterson informs us. The Western Electric Company keeps a record of every cable and its history while in use, as far as can be determined. This is a very commendable procedure, and the fruits of which are evident, since it enables them to trace every defect to its true origin. Important lessons have already been learned from this record, as may be seen on perusing the catalogue of cables issued by the company.

The combination line telephone circuit was another of the interesting novelties exhibited by the Chicago factory. The object of the arrangement is to reduce the talking resistance in a circuit containing several stations. The line first goes through each station, but without including the bells, and loops back through the bells and generator of of each station, returning as far as the first station or that nearest to the central office, and there it is grounded. When a signal is sent from the central office to the first station, the current has to go to the last station and return by the loop to the first station. On the outgoing part of the circuit the wire, as it passes through each station, goes to the telephone hook and out through a contact, formed when the telephone is suspended, to the next station. When the telephone is lifted now at any station, the circuit is opened and all the bells, which as we have seen, are on the return portion of the loop, are cut off, while the circuit now becomes established through the subscribers telephone apparatus and to the ground. Three stations thus arranged were shown. One of the standard Gilliland magneto boxes also had its connections arranged to be worked in this way.

The exhibit of the Gilliland factory, although it formed a special group, may properly be considered as forming a part of the exhibit of the Chicago factory, because the two are in process of amalgamation. The beautiful new building put up by the company in Chicago, corner Clinton and Van Buren streets, will shortly be occupied by both. This magnificent structure, which we take occasion to illustrate herewith (Fig. 13), 350 feet by 50, five stories high, with adjoined blacksmith shop 20x40 feet, and engine-room 40x50, affording altogether a floor space of nearly 100,000 square feet, gives an idea of the magnitude of the industry which the Western Electric Company has developed. Among the noteworthy features of the Gilliland exhibit we should mention an elegant cabinet telephone outfit with carved transmitter box, improved Gilliland apparatus, ornamental brackets on either side of transmitter for vases

or statuary, velvet-covered desk with small moulding enclosures on either side. The design was very uniq ue indeed, and would certainly satisfy the most fastidious of those who require the telephone to be ornamental as well as useful. There was also another called the "parlor outfit," which, if anything, excelled the cabinet set; not so much in the originality of design, however, as in the richness of

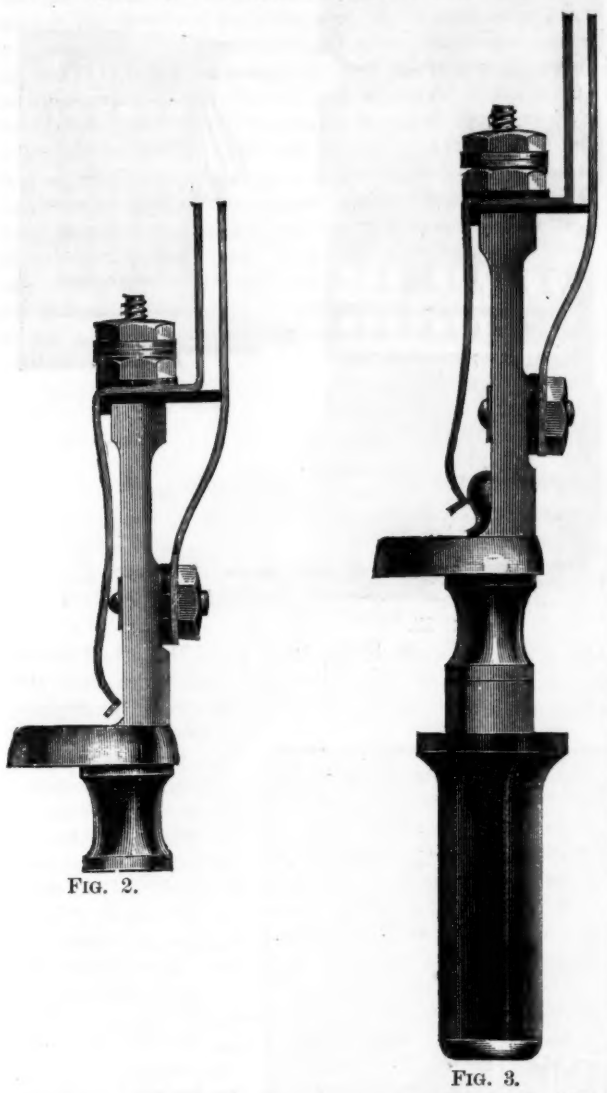


FIG. 2.

FIG. 3.

materials and the finish. This set was made in black walnut, with handsome veneers. Fig. 14 represents a combined set with ornamental battery-box and base-board. A neat, 20-line outfit (Fig. 15), with large fanciful battery box, plush covered, and forming a desk attached to the highly-finished base-board, was also very attractive. These switch-boards were intended for clubs and local circuits, etc. There was also an exhibit of the regular standard "Gilliland Switch-board," like that described in our article above referred to. A 20-line and a 10-line standard switch-board of this description, with magneto and telephone outfit, for small exchanges and aggregations of circuits, also attracted some attention. In Fig, 16 is represented a switch-board having 20 lines suitable for "toll-stations. Beside these were a regular line of the standard Gilliland magneto bells, including various styles of extension bells. The Gilliland generator and bell for subscribers' stations was also exhibited. There are several features of interest in the construction of this outfit (which the Western Electric Company proposes to introduce as a standard), but we ca nn

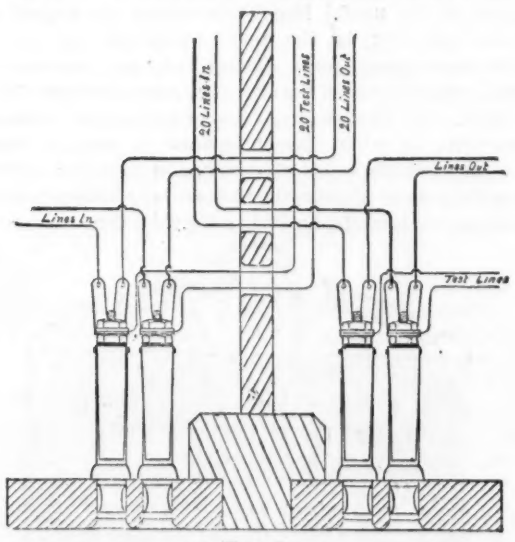


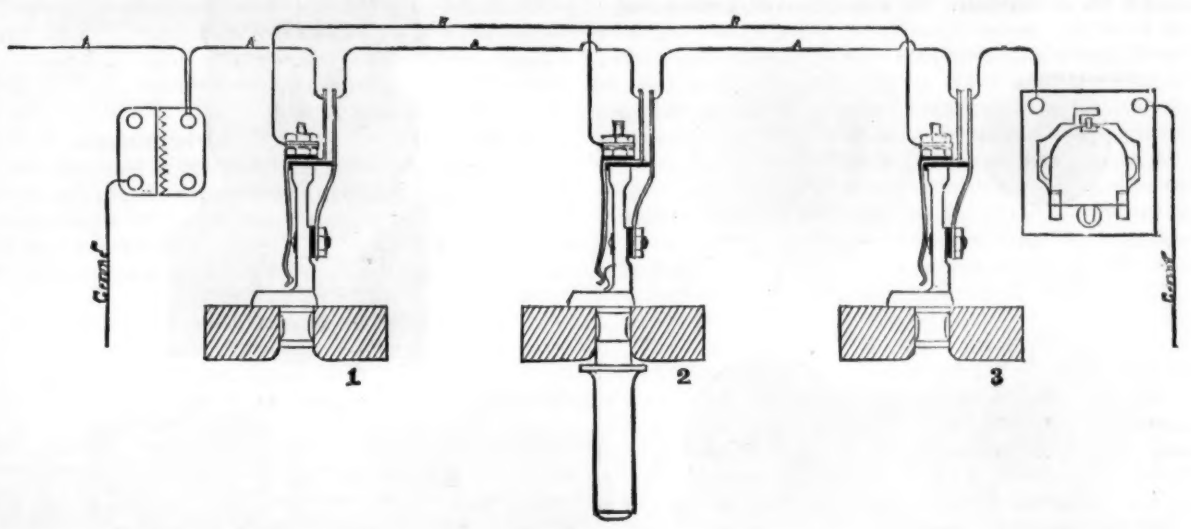
FIG. 7.

now give space to a detailed examination of its peculiarities. The exhibit included some pole changers used where power generators are dispensed with.

The exhibit of the Boston factory (Charles Williams, Jr.) was under the special charge of Mr. F. W. Harrington. There were two types of the "Williams Switch" shown, one a 25-line table to work in a set of six tables for an exchange of 150 subscribers, and the other a 50-line table to work in a set of twelve for an exchange of 600 subscribers.

But little description is needed of this well known switch-board (Fig. 17) which has had a career of extensive and successful application, and which still holds its own pretty well in competition with others. The connections are made by inserting plugs into horizontal connecting bars studded with holes. These bars are divided into sections of four and lettered *A B C D*, etc. The bars of each section *A B C*, etc., are connected with the corresponding bars the other tables,

FIG. 4.



and in this manner the connections between the different tables are provided for. When a plug is inserted in one of the openings in the horizontal strips its extremity forms a conection with a subscriber's line, whose course is vertical or at right angles to the horizontal strips. The point of the plug forms connection with the subscriber's line, not by entering a hole, but by entering between two springs, inclined toward each other in V fashion and forming contact at their extremities. So that instead of the line strips for the subscribers' lines, we have an arrangement resembling

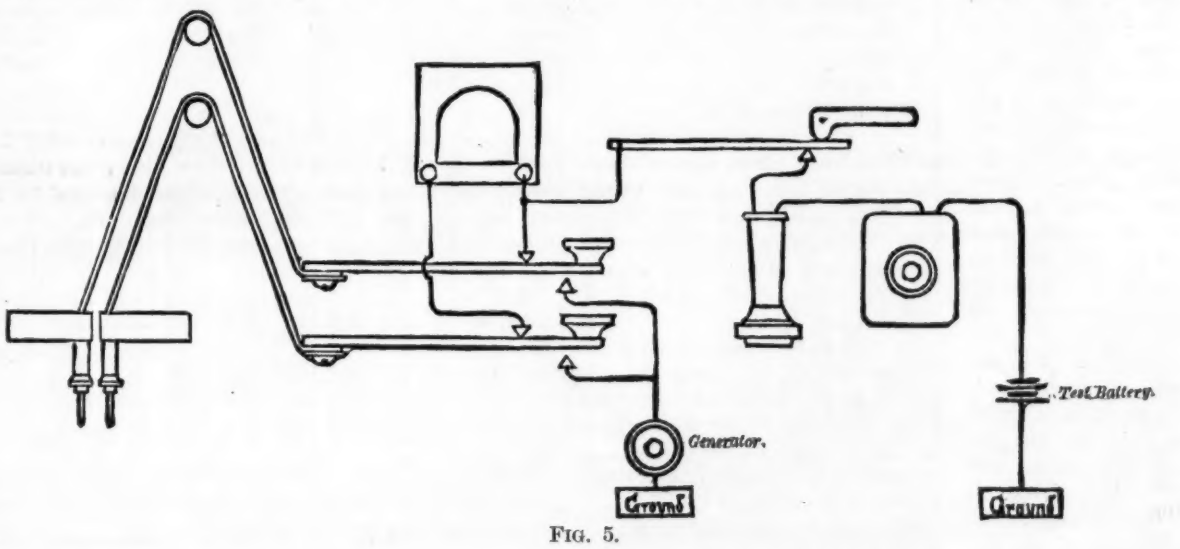


FIG. 5.

several letters V assembled together so as to come in contact at their outer margins, thus VVVV the apex of each V being in line with one of the plug holes on the horizontal or connecting strips. Each vertical row of plug holes corresponds therefore to a subscriber's line, which enters the switch-board through a spring jack placed on the lower margin of the table. The line divides into two branches there, one of which goes to the V shaped line of the upright portion of the switch-board, while the other is connected to the inclined portion,

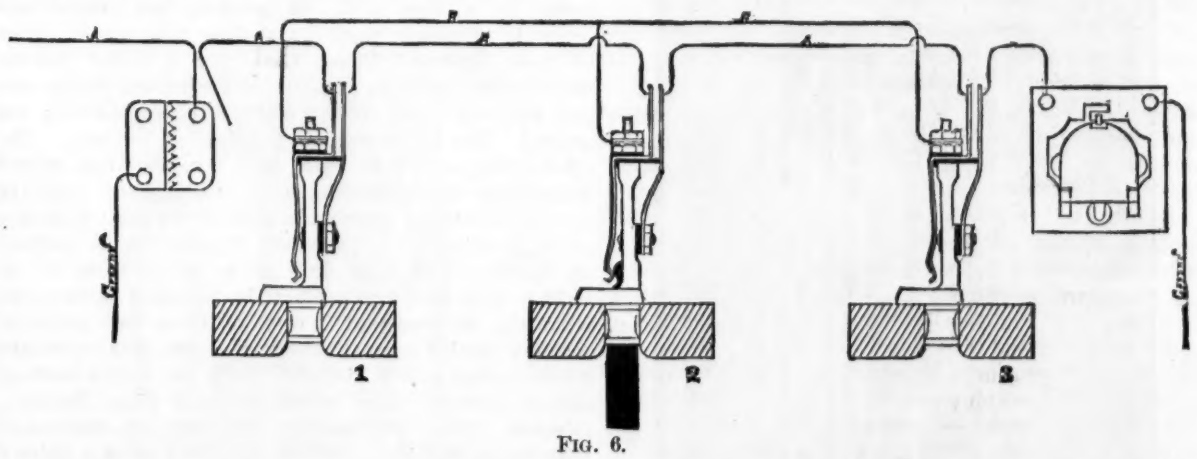


FIG. 6.

first passing through its annunciator. A plug inserted in the lowest horizontal strip, which is connected to the ground serves to ground each line. When an annunciator drops, the operator loops her telephone into the circuit by inserting a jack-knife with flexible cord connections. The number required being ascertained, the jack-knife is inserted into the spring-jack of that number if it is on the same table. The jack-knife is provided with a key and an extra line from the ground through the generator, so that on pressing the key the subscriber is called. If the subscriber wanted is on another table, then the operator calls the operator of the other table. This is done through a special circuit extending from a special spring-jack on the under side of the margin of the table (not shown in the figure) which circuit includes an annunciator. Ordinarily this circuit is closed at the spring-jacks of both tables. When the first operator inserts her jack-knife into the special spring-jack she loops her telephone into this circuit. Now by pressing the key on the jack-knife she closes the circuit through her generator and the annunciator at the other operator's table is dropped. The latter loops her telephone in also, by inserting the jack-knife into the special spring-jack, and, on ascertaining the number of the subscriber wanted she signals him and then takes out the ground plug corresponding to his line to insert it in some one of the connecting bars which is in connection with a corresponding bar on the first operator's table. If the first operator has not already inserted the ground plug of her subscriber into this bar she proceeds to do so, and the communication is then established between the two subscribers. The jack-knife of the first operator is usually placed in the spring jack corresponding to the first subscriber, so that her telephone remains looped in and she may listen until the conversation is ended, after which she disconnects. It need scarcely be said that there are as many special spring jacks as are necessary to enable each operator to communicate with every other.

The Williams factory also had a complete line of magneto-bell and transmitter outfits, presenting a most interesting variety. There were no less than fifteen of the "No. 1 A" magneto sets, with lever automatic switch and magneto generators, having shunts controlled by push button or by cranks that opened the shunt circuits around the generator automatically. The design, the material and the finish differed widely, so as to form a good variety. There were three of these sets also with battery box and desk. Besides these we noticed a very handsome ebonized skeleton magneto-bell and transmitter set of artistic design

and superb workmanship. A magneto set of ash, with base board and battery box, attracted attention by its oddity, though it was not devoid of neatness. One of the neatest sets of all those exhibited was of cherry. The design was quite tasty, though not pretentious, and the appearance of the set, supplied with battery box, desk, drawer for writing materials and magneto-bell transmitter, was very pleasing and satisfactory. A push-button set, with its base-board all made of birdseye maple, also deserves particular mention for its elegance. By way of novelty, was a mag-

Fig. 8.

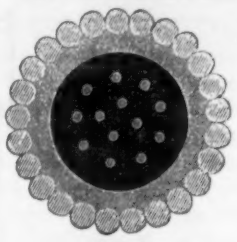


Fig. 9.

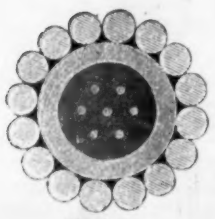


Fig 10.

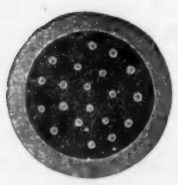


Fig. 11.

neto set in which the generator dispenses with a crank, the motion of the armature being produced by pulling down a pendant on a cord. The exhibit comprised three extension bells of novel appearance. The ordinary hemispherical bells in one were replaced by sleigh bells, in the second by Swiss bells, and in the third by cow bells. All these modified forms of bells give different sounds, and this might be of advantage where several bells are used in the same place. There were several generators for central office use in this exhibit. Several of them were hand generators, and the others were power generators. Of the latter we should specially mention one with two circuits, one giving continuous, and the other giving alternate currents. The resistance of the armature wire is about 400 ohms, and the current produced will ring a bell through a resistance of 25,000 ohms, and drop an annunciator through a resistance of 20,000 ohms.

STANDARD ELECTRICAL WORKS.

The exhibit of this concern was one of the most complete and interesting, and occupied a whole apartment by

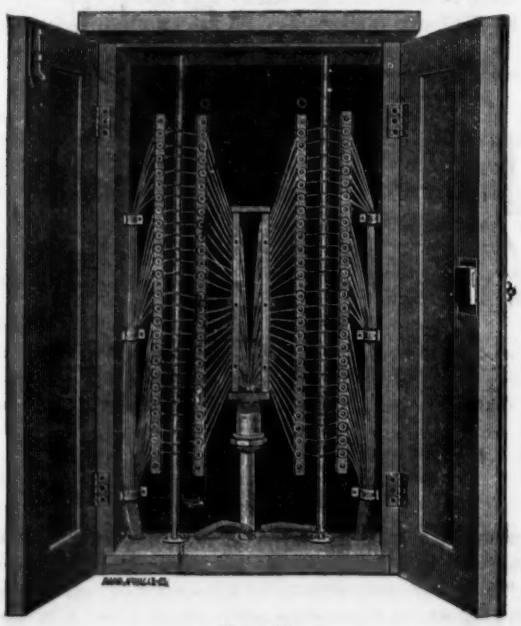


Fig. 12.

itself. The exhibit comprised a new improved "standard switch-board" for fifty lines (with six sets of connecting strips for as many tables), which presents several features of interest. Fig. 18 shows this switch-board, in which the lines run up and down and the connecting strips are disposed horizontally, as in the Williams switch-board, though there are five in each set, *A B C D*, etc., the connections being also made by means of plugs unprovided with cords. Each line enters the switch-board by the top,

Fig. 14.

passing through the annunciator and thence through the vertical line strip to a spring jack of special construction placed near the lower margin of the table (not shown in the figure), by means of which the line may be grounded or else thrown in a switch that controls the telephone and calling battery circuits. (In the figure the lines are shown as grounded at a line strip by plugging, as in the Williams switch-board.) The spring jack used is known as the Snell spring jack. The lower end of the vertical line strip connects underneath with a metallic post, which projects above the surface of the lower margin of the switch table. The upper end of this post is slotted and receives the jack-lever, which is pivoted in it. This lever consists of a flat, fan-shaped metallic piece, which projects on either side of the pivoted joint, in the direction of the slot. There is a vertical spring in front and one behind this lever, in a line with its motion, but when the lever is disposed upright, it does not touch either of those springs. When the lever is pulled toward the operator one of its cam-shaped projections forms contact with the front spring, which is connected with the ground. This is the normal position of the lever. The other spring, which the jack lever touches when moved away from the vertical position, is connected with the lever of a two-way switch, shown near the right hand side on the front margin of the table. This switch is made of an elastic strip of brass, and can be moved from left to right so as to form two contacts by its upper surface, and it can also be depressed in each of these two positions, forming another contact for each position. It is practically a four-contact switch, therefore, with two stable contacts and two unstable ones, which are open when the key is released. When the key is to the left it forms contact with the ground line. When depressed at this point it forms contact with the pole-changer and calling battery circuit to the ground. When the key is at the right it forms contact with the operator's telephone line which is grounded, and when the key is depressed it connects with the magneto generator and the ground.

At the right hand side, each of the horizontal connecting bars of the switch-board terminates in a spring key which can be depressed so it will touch a vertical bar, which forms the margin of the switch-board on the right hand side. This bar is also connected with the operator's telephone and with the ground. These switch-boards are generally provided with power generators operated by a treadle

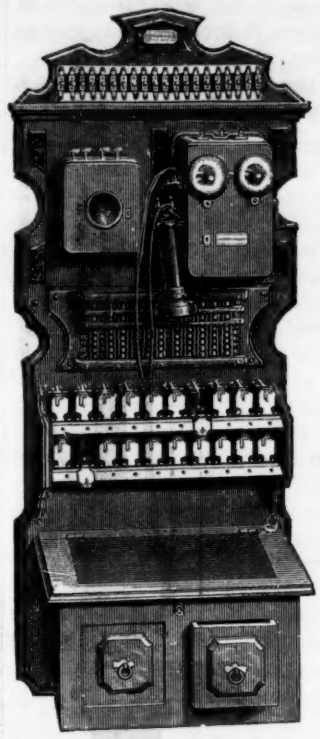


Fig. 15.

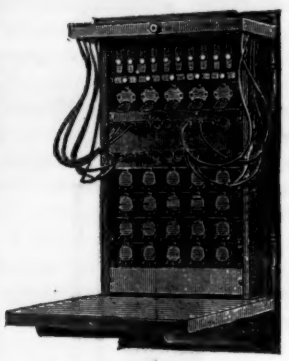


Fig. 16.

with a spring contrivance that keeps the crank of the driving wheel off from its "dead center" so that the wheel will always start with ease. A simple description of the modus operandi, pursued by the operator, will readily show the advantages of this switch-board. As soon as the annunciator drops, the Snell jack lever is thrown backward, cutting off the line from its ground (through the other contact spring of the Snell jack). The line becomes thus prolonged to the switch. The switch being at the right, its normal position, the line is thus prolonged through the operator's telephone to the ground, and the operator can converse with the subscriber. She then throws the Snell jack to the upright position, thus disconnecting the subscriber entirely, and the throws forward the Snell jack of the subscriber wanted, which brings this to the switch. She presses down the switch to close the circuit including the generator, or moves the key to the left and depresses then when the pole changer and battery are to be used. She then moves the second subscriber's Snell jack to the upright position, and she proceeds to make connections between the two subscribers by inserting plugs in one of the horizontal connecting strips for both lines. She depresses the key forming the right end of this strip, by which her telephone is made to form a derivation from the point of connection between the two lines to the ground. She can thus inform both subscribers that the connection is made, and when she finds the conversation

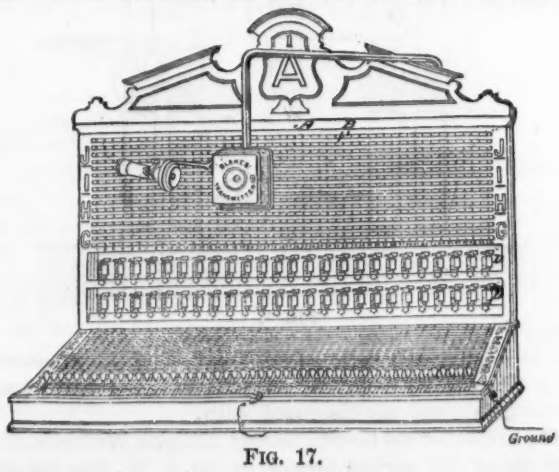


Fig. 17.

established she releases the key and replaces the annunciators. When the conversation is ended one of the subscribers "rings off" which drops either or both annunciators. The operation of making connections between two subscribers on different tables is substantially the same.

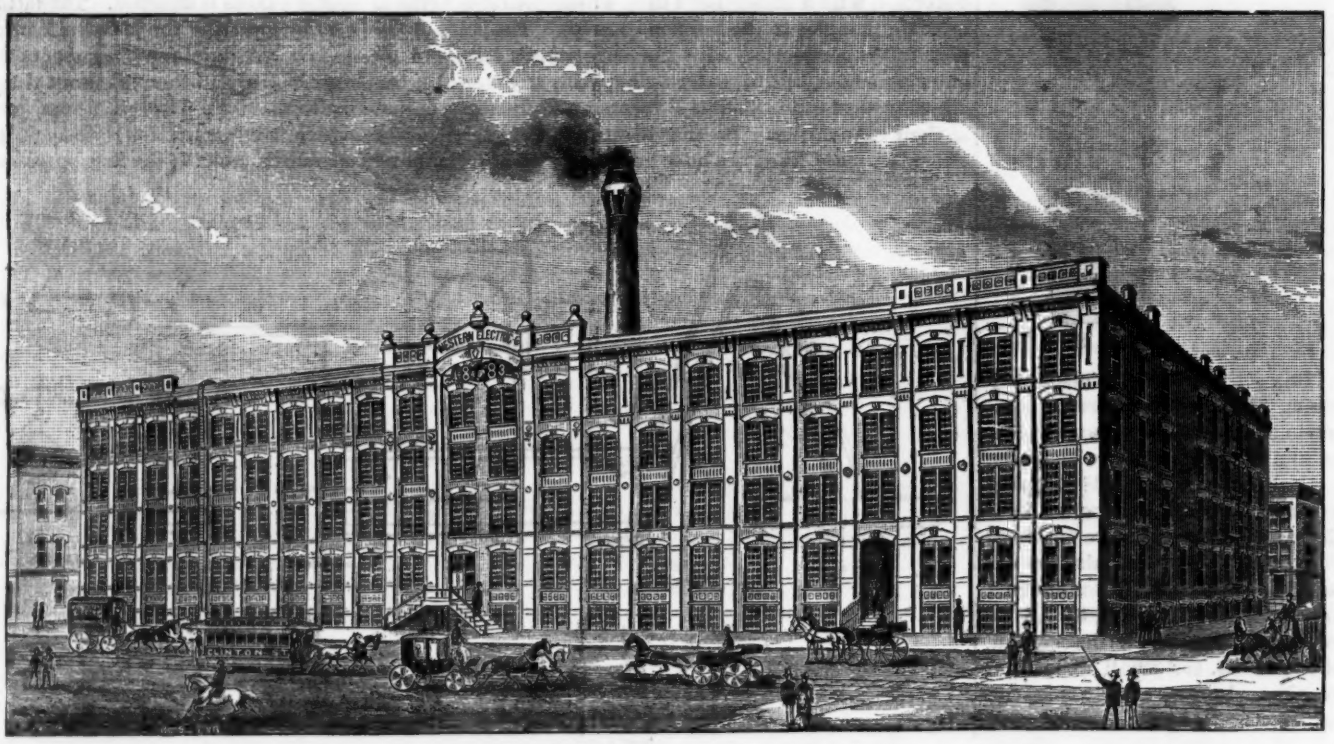


FIG. 13.—WESTERN ELECTRIC COMPANY'S NEW FACTORY.

Corner Van Buren and Clinton Streets, Chicago.

The operator informs the operator at the other table, either by ticket or by special telephone connection, of the want, and the connections are then made on one of the connecting strips at both points. The Standard Electrical Works also exhibited an assortment of smaller switch-boards. A 20-line club switch-board (Fig. 19) attracted great attention by its artistic design and workmanlike construction, the carving and intaglio work being especially admirable. This outfit, as seen in the figure, is provided with universally adjustable support. The battery box is quite roomy, and the desk is larger than is the case usually. The company makes all sizes and varieties of these switch-boards, one for six lines being also exhibited. There were several varieties of the well-known "Post" generator, which this company manufactures, some for use where power is available, some to be run by hand. Of these hand generators there was one fitted into a box so that it could be fastened to a wall or to the switch-board frame. The power generators (Fig. 20) seem to be particularly well adapted to the requirements of central office generators. The pole pieces of the magnets in which the armature revolves are made of soft iron, fastened

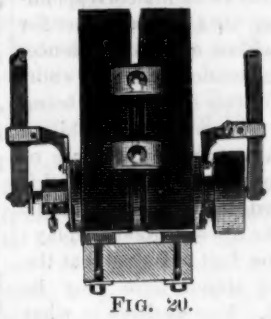


FIG. 20.

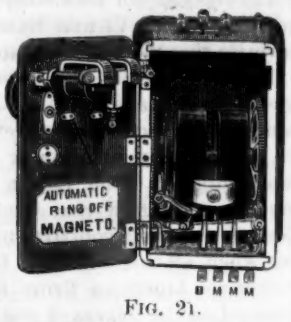


FIG. 21.

together by brass pieces. The brass is cast between two iron pieces and the resulting block is then bored out for the armature, thus securing solidity and permitting close revolution of the armature. The bearings are made of steel, and the shaft is of large diameter so as to last almost indefinitely without derangements of any kind. The resistance of the armature is about 1,200 ohms (No. 36 wire) and the current generated will ring a bell through a resistance of about 45,000 ohms. The current is taken off by wide copper strips provided with binding posts and bearing on the shaft at each end. The hand generators are provided with fine-toothed gear wheel, that run almost noiselessly. It is claimed that they will ring a bell through a resistance of 35,000 ohms.

The exhibit of magneto-bell outfits of this company was quite complete in numbers and varieties and novelties presented. There were about twenty No. 1 "Standard" magneto bell sets of all description for subscribers' stations. The magneto-generator in these was thrown out of shunt by a push bottom in some cases and in other cases by an ingenious contrivance attached to the armature and turning with it and operating by centrifugal action, so as to open the shunt at a certain speed of rotation. A very novel and ingenious appliance was the "Painter automatic ring-off bell" forming part of this exhibit. It frequently happens that subscribers forget to ring off when the conversation is ended and this is a device for obviating all annoyances and delay from this source. In this arrangement (Fig 21) the driving shaft of the magneto carries an additional gear wheel at the left hand side. A disc moving loosely on the shaft carries a ratchet, the end of which is forced into the gears of the wheel by a small spring. When the generator crank is turned therefore, the disc, engaged by its ratchet, is moved with the gear wheel in opposition to a spring fastened to the box and to the disc. This spring is stretched by the first half revolution of the disc, but on the second half of the revolution it tends to assist the rotation; but just as it is about to do so the other end of the ratchet comes up against a "trip," which engages it and makes the ratchet lose grip on the gear wheel so that the generator shaft can move freely, while the disc is prevented from movining forward. When now the subscriber picks up the telephone the hook lever moves upward and a detent which it carries engages the lower end of the trip. When the converration is ended the telephone is replaced on its hook as usual and this detent pulls down the trip which is of bell crank pattern, so that its upper end slides off from the trip end of the ratchet, when instantly the ratchet engages the gear wheel of the driving shaft once more and at the same time the large spring pulls the disc around rapidly, thus moving the driving shaft for a half revolution and causing several rotations of the armature.

There were three combination bells, for use where a factory and office are to be on the same circuit. Each is provided with a two way switch and two bells of different tone. While the office is talking with the factory the central office may call the former by ringing the other bell. When the conversation is ended the switch is turned to the central office circuit which latter may then be signalled. When the switch is moved midway between the wo contacts the factory may call the central office. There was also a six-point combination outfit on this principle, with two ground connections so that all circuit combinations are independent and secure secrecy. An interesting set was the "extra territorial" (Fig. 22) for use on long lines, with cut-out on top, by turning which in one direction the circuit can be closed, while by turning in the other direction the line is short circuited without entering the bell, thus affording excellent protection against lightning. The mag-

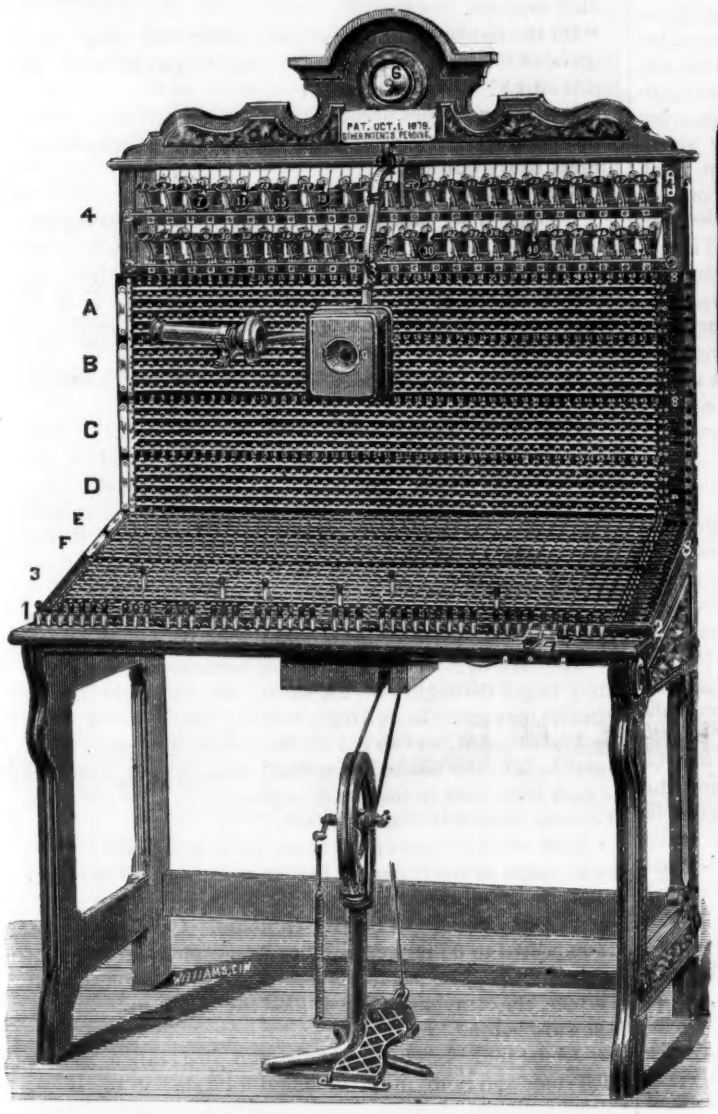


FIG. 18.

FIG. 22.

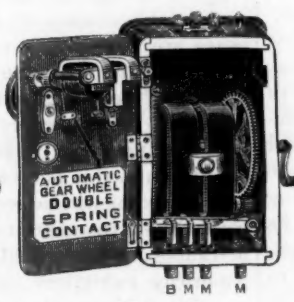


FIG. 23.

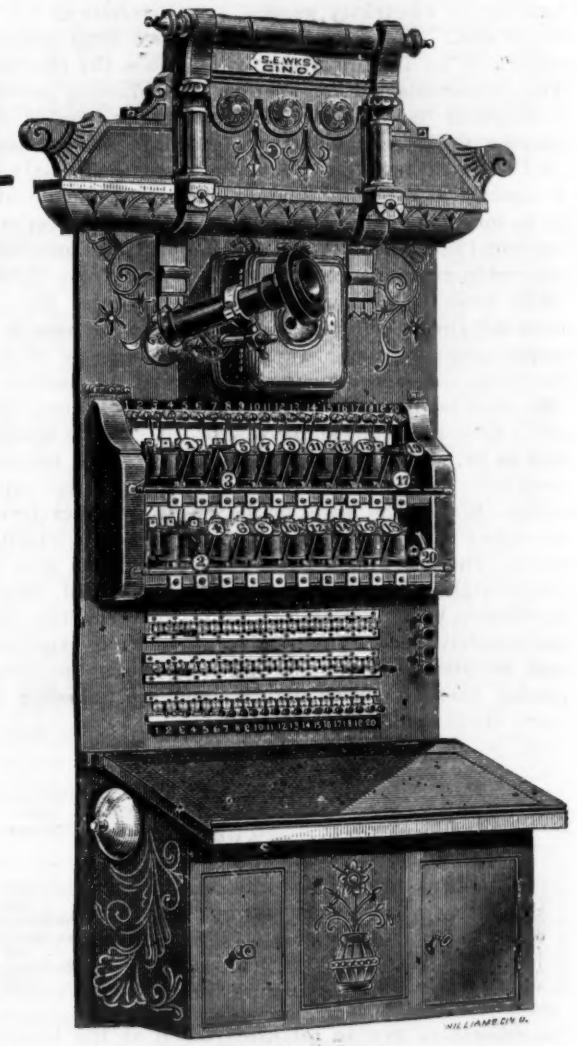


FIG. 19.

FIG. 24.

FIG. 25.

FIG. 28.

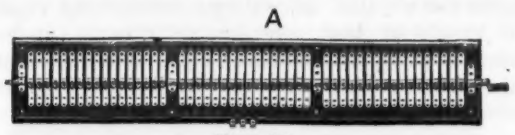


FIG. 26.

FIG. 27.

neto is capable of ringing a bell through 4,000 ohms resistance. The automatic gear wheel sets, with double spring contact, Fig. 23, also formed a part of the exhibit. The No. 2 bell, for short lines, differs from the No. 1 in that the magnets of the generator are not provided with pole pieces enveloping the armature. They are provided with push-button shunt or automatic shunt, as desired. The secrecy switch was applied to some of these bells. The Standard Electrical Works are evidently alive to the fact that the patrons of the telephone appreciate the beautiful as much as the useful, for their exhibit of fancy outfits rivaled with any in excellence. In Fig. 24 we represent a parlor carved transmitter and magneto set, in walnut, with plush-covered desk that needs only to be seen to be admired.

There were others equally beautiful in style and finish, made of cherry and ebony, and we noticed particularly three sets in fine woods and finished with inlaid gilt oriental designs that seemed very rich and ornamental. Among the other novelties in this department was a magneto bell and battery box combined, with small shelf desk projecting. This is a compact outfit, and will no doubt find much appreciation in many situations. Some of the transmitters were provided with the transmitter mouthpiece, made by this concern. This consists of a flaring funnel-shaped device of nickel-plated sheet metal, and which fits over the mouth of the transmitter. A number of extension bells of (Fig. 25) various designs should also be mentioned. A lightning arrester for fifty lines (Fig. 26). This lightning arrester is simple and compact, being composed of two sets of metallic strips placed side by side, one set, for the lines, being disposed above, and the other, for the ground,

Continued on page 125.

The Electric Light Fire Risks.

The risk from fire in electric lighting is a matter that now presses for consideration, and much interest attaches, therefore, to the paper read by Mr. R. Hedges, at the Southport meeting of the British Association, an abstract of which appears in the English papers. "There is a great difference," said Mr. Hedges, "between the electric currents which have been in constant use for telegraphic purposes and those which are to be supplied by the undertakers under the Electric Lighting Act. The latter can only be said to be free from danger when the heat generated by the current is utilized in its right place, and not developed in the conductors or wires which lead the electricity to the incandescent lamps. The Fire Risk Committee have already issued rules for the guidance of users of electric light. These can hardly be said to embrace all the salient points of the new subject, which can only be arrived at after years of practical work. The necessity of proper regulations has already been recognized by the insurance offices, both in the United States and Germany, and some of their special rules are given in this paper. The conductors must be properly proportioned for the current they have to carry; whatever resistance there is in the conductor will cause a corresponding development of heat, which will vary with the amount of electricity passing, and inversely as the sectional area. The material must be free from impurity, otherwise an impure section will increase the resistance. The extraordinary difference in the conducting power of a sample of 'commercial' Rio Tinto copper wire, as compared with the pure metal, was shown in an experiment by Dr. Matthiessen, the conducting power being only 13.6 as against 99.95 for pure copper. The continued heating of an impure metallic conductor has a certain effect on its electrical resistance. With the sample just mentioned, the conducting power at 100° C. decreased from 13.58 to 13.558 after the wire had been heated for three days. It does not always follow that there will be a decrease in the conducting power, as, with alloys, the opposite effect is produced. A copper-silver alloy showed an increase of .264, after having been heated to 100° C. for three days, and a tin-copper alloy an increase of .13. As the temperature in Dr. Matthiessen's experiments was not increased over 100° C., the author has made some further experiments—heating the wires by the electric current from a secondary battery to within a few degrees of their melting point. The following materials were tried, the wire and foils having such sectional area, and so arranged, that on the current being increased by twenty per cent. they were immediately fused. The total length of each experiment was twenty-four hours, during which time the current passing through varied slightly, and the following is a mean of the results:

Material.	Resistance before heating.	Resistance of leads.	Difference after 24 hours.
	Ohm.	Ohm.	
1. Commercial tin wire	.815	.8	- .003
2. Lead, soft	.835	.8	- .005
3. Copper, soft	.81	.8	No change
4. Pure tinfoil	.86	.8	No change
5. Tin and lead alloy	.87	.8	- .160
6. Albo alloy, in foil	.835	.8	No change
7. Aluminium and tin alloy	.82	.8	+ .0008

The resistances were in all cases taken at the temperature of the air, which averaged 69°. The sign – shows that the metal decreased in resistance, and + that it increased after continued heating. Nos. 1 and 3, tin and copper, were found to scale when heated. A change has been noticed where high tension currents have been sent through a pure copper wire for some time—the wire in the armature of a Siemens machine, which came under the notice of the author, appeared to be brittle, and gave a fracture unlike pure copper. The necessity of good electrical connections is very great, also special arrangements of switches and contact-breakers, which, when left in unskilled hands, are liable to cause dangerous heating or an arc. Short circuit is the danger which may be caused by badly arranged wires—most likely a conflagration will ensue unless the remedy suggested by the Fire Risk Committee and the Board of Trade is adopted, of having a cut-out or fusible plug in the circuit, which gives way when the current is in excess. These should be arranged to melt if the current is more than 10 or 15 per cent. of the working strength, otherwise absolute safety is not arrived at. Ordinary lead or tin wire cannot be used except for very small currents, as, on fusing, the metal is scattered in a globular form, when it is liable to cause fire. The plan adopted by the author is to take pieces of foil arranged like the leaves of a book. The thinness of the foil causes it to be almost volatilized when melted. The material found to be the most reliable is a special alloy of aluminium, termed albo metal, which is extremely tough, and can be worked much nearer to its fusing point than tin or lead. The safety of an electric light installation is only insured by testing, which should be done by a current of higher electro-motive force than it is intended to use. When the work has been properly supervised no trouble should be experienced, and the electric light may be said to be much safer than gas, as it is free from those accidents which are due to a servant's carelessness, or by the leakage of pipes. Whatever danger there is with electric lighting is entirely localized to the generating station, where the dynamos and engines would be under constant supervision."

The United States at the Vienna Electrical Exhibition.

The reporter for *Ironmonger* remarks in his correspondence from the Vienna Exhibition that it is a matter for surprise that the United States, where electrical science, aided by the genius of Edison, has made strides so enormous, should take so little part in this exhibition, being content, in fact, if we exclude two notable exhibitors to be presently mentioned, with the merest pretense of representation. The Edison Company, it is true, and it must be admitted that the United States Electric Light Company as well contrives to make a very good display; but when all this is allowed for, the fact remains that the collective American firms having stands here may be counted on the fingers of one hand. Nor is there in what they submit for inspection anything new or noteworthy. This has occasioned a good deal of surprise, not to say disappointment, as it was thought that, in view of the Electrical Exhibition to be held next year in Philadelphia, the Americans would muster strongly on this occasion, and inundate us with those "notions" in the production of which they may be said to stand unrivalled. But it is far otherwise. There is no American section worthy of the name, and in this regard they are an infinite distance behind ourselves, with all our backwardness. For this unaccountable absence of American co-operation many surmises are hazarded, the most feasible explanation being that they are reserving all their energies for the show, which, of course, would be nothing if it did not "lick creation," to borrow the expressive phraseology of our enterprising cousins. It is already stated that no electrical exhibition in this played-out hemisphere can "hold a candle" for what will be seen next year in Philadelphia; and if this be so, the supreme effort which is to achieve so remarkable a result would easily account for the paucity of American exhibitors, who must of necessity be now engaged in "storing their own energy" for the great undertaking that is to astonish this benighted half of the globe.

Electrical Studies.

The Stevens Institute at Hoboken has just begun its thirteenth year, and an addition to the faculty has been made in the establishment of a chair of applied electricity, now held by Professor William E. Geyer. This gentleman, who has long been connected with the institute, says of the curriculum: "When a young fellow enters the institute, the first year is spent in devotion to mathematics, mechanical drawing, physics, belles lettres and one language, either German or French. The literature of engineering is in these two languages, and no man can be thoroughly grounded in his profession who has not the faculty of knowing what has been and is being written in those languages about it. Mechanical drawing we make a great point of, because it is the written language of engineering. Belles lettres cannot be omitted if the future engineer is to hold his own in the society to which he will be admitted by eminence in his profession. In the second year the pupil has more mathematics, more mechanical drawing, more physics, more French or German, more belles lettres, and he is introduced to the study of chemistry, so that he may know the nature of things. In the third year his mathematical studies ascend to analytical mechanics and the resistance of materials; he continues his mechanical drawing and his physics, and begins the study of engineering in a more special sense. He continues his chemical analysis, his one language and his belles lettres. But, by this time, the two last studies have become a source of pleasure, and are no longer tasks requiring brain toil. His fourth and last year is largely devoted to working in the physical laboratory, determining expansion of metals by heat, studying calorimetry, applied electricity, accurate measurements, etc. About one-third of his time is left at his disposal, but he is required to make some special investigation and write a thesis upon it."

Electrical Studies at Yale.

In our issue of the 6th inst. we gave some interesting particulars as to the course and manner of the electrical studies to be pursued at Harvard. We can now supplement those details with a few about the intentions of Yale. During the summer the new Sloane physical laboratory there has been so far advanced that it will be ready for occupation in a couple of months. The building stands on Library street, where it will be undisturbed by the jar of passing vehicles. It is of brick, three stories in height, with a basement and a tower. Its arrangement has been made under the direction of Prof. A. W. Wright, who, together with Prof. Gibbs and Prof. E. S. Dana, will have offices in the building when completed. On the first floor is a recitation room, a large lecture-room, with facilities for the performing of experiments in the presence of the class, store-rooms for apparatus, a general experimenting-room for students, and a special room for experiments in electricity, which has been made without the employment of iron in its construction. On the second floor are rooms for general experiments supplied with permanent slabs and special rooms for experiments which have to be made in the dark. On the third floor, and in the tower, are rooms for experiments in optics, acoustics, and meteorology. The general object kept in view in the construction of the building has been to supply what needs can be known in advance, and at the same time to rely on what experience shall allow for the complete mounting of the remainder. The college has found in the Messrs. Sloane generous benefactors in a department where assistance was particularly needed. The building will be thoroughly equipped by them with apparatus and will afford the fullest appointment for instruction and investigation in physical science.

The Life of a Carbon Changer.

All down Delaware Avenue, on Friday night, says the Philadelphia *Times*, a half a league of a glowing electric light bowls at the top of half a league of thirty-five fee poles, sputtered, turned from white to crimson, and then sputtered again and turned from crimson to white. At the same moment an inquisitive stranger at the corner of Vine street heard a man on top of the pole in that neighborhood swear and snap his fingers. The stranger proceeded to "tree" the man on the pole. Pretty soon he came down. He was small and wiry, and carried a carpet-bag full of gilded crayons.

"Do the lights sink because you swear and snap your fingers, or do you swear and snap your fingers because the lights sink?" said the stranger.

"I snap my fingers because they are stung," replied the small man. "We poor devils of inspectors often have our fingers badly burned."

"Why is that?"

"Because if we take hold of the line wrong in fixing the lamp we get our fingers stung. Letting go quickly, we frequently open the circuit. Then the lamps all sink, but before they can go out we have it closed again. It don't happen often, though, nowadays, but it's the commonest cause of that sputtering in a line of lamps."

"Don't you sometimes get a worse dose than a finger-burning?"

"Not often. I got a queer shock once, though. I had a line cut and the circuit was open. I had one end of the cut line in my hand. The ladder on which I was standing shook a little, and I threw out one hand and caught hold of an iron awning post. Just as soon as I touched it the current was established again, and I got a shock that made me see stars."

"It is a wonder that you were not killed like the man in New York."

"The man in New York got killed because he was in a hurry to get through with his work. He had eight or ten wires to manage. In cutting a loop he didn't finish with the first of them, and so got all the power of a sixty-light machine into the last of the wires. After he cut this last he took both ends in his hands to join them. The current, of course, passed through his body."

"How often do you climb those poles in a night?" said the stranger as the inspector halted at the base of another pole.

"As many times as I can in ten hours. I and my mates are expected to do it once an hour," and, putting one foot on the first peg, he began his ascent. With his back against the pole, the stranger yawned like the dark gulf of the Delaware behind him.

It seems that his chatty companion had fallen in love with some starry divinity, so long did he stay in the skies. Clump-a-clump, clump-a clump came the inspector's boots down the pole at last. 'Found a soft carbon up there," he said, as he struck the earth. "I had to take it out and put in another; it didn't burn straight."

"Oh, that's what you carry those gilt-edged slate-pencils for?" was asked.

"Yes, they're extra carbons. Don't have much use for them nowadays though. They make 'em better than they used to do."

"Do you do this every night?"

"No," was the reply. "Every other week. I'm a trimmer and work by day."

"What do you do then?"

"I have to put four new carbons in each of twenty-seven lamps, first taking out the burned ones, and I have to clean the lamps."

"I shouldn't think anybody'd know whether you'd cleaned 'em or not, they're so high up," said the stranger.

The inspector looked at the speaker solemnly, and drew something that looked like a coil of scorched auburn hair out of his pocket.

"Do you see that?" he said. "That was a part of a spool of wire in an electric lamp that cost $8—the spool did, see? Well, the rod that held the carbon in that lamp wasn't cleaned. So instead of feeding properly—you know it slips the under carbon down as it burns—it stuck."

"The lightning took a short cut through that spool and burnt it like thread. You see, the lamps are cleaned for something beside show."

"Don't those carbons burn out too quick for you sometimes?" was asked.

"If we catch 'em at it we retire them, but there's an automatic cut-out in these Maxim lamps that switches the light from the burnt-out pair of carbons at 12 o'clock each night on to the other pair. The carbons retire one another, you see."

"Are you responsible for the wires as well as the lamps?"

inquired the stranger, as he halted before turning up Chestnut street.

"You can't expect everything for $2.25 a day, can you?" replied the inspector. "No; there's a regular set of telegraph linemen for that. They have to watch the wires, especially at fires, when it's their duty to cut the connections into the burning buildings and take out their lamps. Such lamps as the ones in the Arch street opera-house and the Dime Museum are worth $60 apiece, and a lineman will take a big risk to save property of that value. Then they have to uncross the wires when the firemen lay their ladders over them. One of our linemen sat on top of a telegraph pole nearly all night at a late fire in Richmond shaking out crosses."

The Telephone in Springfield, Mass.

Speaking of telephonic extension in Springfield, Mass., the local *Daily Union* of the 13th inst. says:

The rapid growth of the telephone business in this city has been quite remarkable. A very few years ago the idea that conversation could be easily and distinctly carried on not only from one point in the city to another, but from this city to towns and cities miles away, would have been scouted. The first real practical illustration of what the telephone might be made to accomplish was given at the City Hall some five years ago. The hall was filled, and two or three little boxes were suspended from wires at different points. Then the audience waited patiently to hear something. The sound came at last from voices singing in another building not far away, and everybody applauded. Music could also be heard from Westfield, but when it came to hearing anything from Pittsfield, only a very few persons could do so, though every one tried his level best to catch the sound. The audience was much pleased and decided that perhaps the telephone might do for short distances, but as to putting it it into practical use for talking from one town to another, that was quite another thing. Not long after the gas company's office at the corner of Main and State streets was connected by telephone with its works, and J. H. Banks & Son had a similar arrangement between their office and yards. The late George Dwight took much pleasure in allowing his friends to talk from the gas company's office, and for a long time people visited the place for that purpose. In 1879 W. J. and Henry Denver, of the Western Union Telegraph Company, started out in behalf of that company to form a telephone company, and soon had secured the names of a number of well-known citizens. An office was opened on Pynchon street, under the Opera-House, and Frank G. Daboll was installed as operator. The first instrument was put in at the Springfield club-house, and was at once put into active use by people who wanted to try it and experience the then novel sensation of carrying on a conversation with some one they could not see. As soon as the practical benefits of the telephone became apparent the instruments were in demand, and another company began business over the Second National Bank, selling out to the old company, however, after running for some time. The business increasing, Miss Mary O. White was secured as an operator shortly after the office was opened, and about a month later Miss Lizzie A. Lane was added to the force. E. B. Baker became manager, the force of operators was further increased and the demand for telephones grew steadily. The name of the company was the Springfield Telephone Company, but it has since been changed to the Hampden, and later to the Bay State. Mr. Baker resigned and Mr. Daboll was given the position of manager, which he filled ably and well until last October, when he was made division superintendent, taking under his charge the offices of this city, Holyoke, Northampton, Westfield and Palmer, with their tributaries, and being succeeded as manager by Guy Carleton, who has had much practical experience as an operator and in the general work of the business. In 1881 there were four young women operators employed, and in April of that year the office, which had greatly outgrown its quarters, was removed to its present location in Kinsman's block. A very rapid increase in the business has resulted, and it is still growing. The force of the office now consists of Miss White, the chief operator, and seven young women and one young man as operators. The office is never closed. The young women begin work at 7.30 A. M. and work regularly on week days until 6 P. M. The young women take turns at working until 9 P. M., so that three operators are on duty every evening, and for this extra labor each is allowed three hours out on one afternoon of each week. The night operator goes on at 6 P. M. and remains until 7 A. M. From 10 P. M. to 6 A. M. he is required to punch a night clock every 15 minutes. The young women also take turns at Sunday work so that one of them is on duty every Sunday afternoon. There are now 643 instruments working from the office in this city. There are eight switchboards with a capacity of 35 wires each, and about 175 wires are now working. Conversation can now be carried on as far north a Brattleboro, Vt., east as far as Boston by repeating at Worcester, west as far as Albany by repeating at Pittsfield, and south to Bridgeport by repeating at New Haven, and scores of intervening towns and cities are also connected. The rules of the office are necessarily strict, and visitors are not allowed in the operating room. From the outer office, however, a constant succession of "hello," "wait a minute," "cannot get the party just now," "all through," "go ahead," etc., may be heard, confusing to the ear of the uninitiated, but indicating that the telephone-using public have learned to appreciate the usefulness of the telephone and is using it very freely

Use of the Light in London.

In a recent article on electric lighting in London, the *Pall Mall Gazette* defends the electric lighting companies from the accusation of having failed to use all due despatch in introducing the new illumination, saying that they have used the utmost despatch and shown the greatest desire to get to work and test the all-important question whether the scientific imitation of daylight can be produced and supplied to private houses over a large area at an equal or possibly less cost than gas. There has naturally been great competition between the companies to secure the most desirable districts in London, and the final allotment of these districts has been made by mutual agreement between the companies, the Board of Trade and the local authorities. The acts of Parliament under which the lighting is to be done provide for the lighting of areas under two schedules. Schedule A is a restricted area, certain specified streets of which must be provided with the electric light in two years, and the remainder, upon requisition, within six months thereafter; Schedule B, an extended area, beyond the boundaries of Schedule A. may be added to the area of supply by the Board of Trade, upon the application of either the local authority or the lighting company; but the former cannot apply until the 25th August, 1885, whereas companies can do so now, or at any time after the passing of the act, always, however, with the concurrence of the local authority. Within six months of the date of obtaining their provisional orders the companies have to appropriate a stipulated sum of money to each order, and also deposit, out of that sum, a given proportion as a guarantee that the works shall be carried out. This latter sum is to be repaid them as the work of installation proceeds. Certain streets are set apart in each order in which electric cables must be laid within two years. For the security of the public a penalty of revocation of the grant is provided in case of a flagrant failure to comply with the requirements of the order.

The Metropolitan Electric Light Company, which ambitiously, at one time, cherished the idea of having the metropolis to itself, secured no less than 28 districts, or areas, out of 41 applied for. These districts are mostly those in the east of London, the city proper, some of the suburbs, and several on the Surrey side of the Thames. Holborn is probably one in which work will first begin, and is one of the best controlled by the company. The Pilsen-Joel Company has obtained one small order for the district of St. Giles. The Edison Company has also only one order, but it comprises the choice area of St. James', which, with its clubs, great hotels, theatres, etc., has been described as the *crème de la crème* of the allotted areas, although the industrial centres offer the greatest inducement for utilizing electricity for power. The Swan Company has secured four districts, including the Strand, Kensington, Victoria and Hanover square.

The Alleged Luminosity of Magnets.

The late Baron von Reichenbach, in a remarkable work entitled the "Dynamics of Magnetism," described at great length a series of experiments with certain persons of peculiar nervous organization, which proved, as he claimed, that there is a peculiar luminous emanation arising from the poles of a magnet, resembling a faint electric discharge in rarefied air.

In the *Philosophical Magazine* for April last there is an account of a series of experiments made by a committee appointed by the Society for Physical Research, with the view of proving or disproving the existence of this alleged phenomenon. This committee has just reported through Prof. W. F. Barrett. From the report in question, it appears that neither Prof. Barrett nor any other member of the committee was able to perceive the emanation in question; but they succeeded in discovering two persons, one described as "a certain gentleman," and the other—a boy—"as an assistant in a baker's shop," both of whom appeared to be able, in a room perfectly dark to other people, to see a faint glow, like a waving cone of light, at both poles of a strong electro-magnet, and to be able to distinguish, by the appearance and disappearance of this glow, when the current was turned on or off with the aid of a commutator in charge of a party in an adjoining room. From the account of the manner of conducting those experiments, it would appear that the committee had taken every reasonable precaution to guard against deception.

There is nothing absurd or impossible in the phenomenon alleged to have been discovered by Reichenbach; that which has always caused it to be looked upon with suspicion by scientific men is the fact that it can only be observed by a limited number of persons whom Reichenbach calls "sensitives." It would appear to be a comparatively easy task to subject this as yet questionable phenomenon to such a rigorous examination as to place its existence or nonexistence absolutely beyond further question. The experiments of Prof. Barrett's committee do not seem to have been extended enough to satisfactorily settle this question. —*Manufacturer and Builder.*

Electricity in Newburyport Mills.

It is a curious fact, which the writer has never seen explained, that the mills in Newburyport, Mass., suffer much more from electricity than similar manufacturing establishments inland. Dampness deadens electricity, and it would seem as though the moist atmosphere of the seashore would relieve mills of electric disturbances more readily than the dryer air of an interior town. But a 12-inch belt, which would run without perceptible electric influence in Lowell, would, if run unprotected in Newburyport, cause the hair of a man who passed under it to stand on end.

Many years ago, the carding room in the upper story of the Peabody Mills in Newburyport was known as an "electrified room." So much static electricity was generated and held during dry weather, that it sometimes became impossible to operate the machinery. The difficulty was removed by the use of a large blower, which would force air from the damp basement into his room, whenever the overseer reported that the electricity was causing trouble. It was generally necessary to change the air in the room in the middle of each half day.

At the Victoria Mills, the agent, Mr. Stiles, has an iron rod, with projecting teeth, like the head of an iron-toothed rake, stretched across the 28-inch main belt on each floor, and from this contrivance a copper wire carries the electric fluid to the ground. Before this arrangement was perfected, the power of the electricity was sometimes so strong as to draw the roving from a neighboring spinning frame.

The Origin of Lightning.

In explaining satisfactorily the phenomenon of lightning, a difficulty is encountered in accounting for the enormous electric tensions, which are necessary to explain the great length of the spark often observed. The theory is advanced by A. Fick that the high tensions are produced by the sudden concentration of electricity already existing in a free state. This concentration is caused by the formation of large drops of rain from the small vesicles of moisture existing in the clouds, by which the surface upon which the electricity exists is greatly diminished. The sudden formation of drops of water from the mass of aqueous vapor may be due to the advance of cold air-currents. Mr. Fick endeavors to answer two objections which may be urged against this theory: 1. That in every rain storm lightning ought to be seen. 2. That it ought to rain whenever it lightens. To the first objection he replies that the drops may be formed gradually, and not suddenly, in which case the tensions would be dissipated gradually; and to the second, that the drops are always formed in connection with lightning, but that in falling to the earth they sometimes encounter a layer of dry air, and are absorbed in their passage.

Conflicting Cable Messages.

The special committee appointed by the New York Coffee Exchange to inquire into the cause of the conflicting official telegrams from Rio Janeiro, which created such excitement in the coffee market on Saturday and Monday last, held a meeting late on Thursday afternoon. It appeared from a letter from J. A. Scrymser, President of the Central & South American Telegraph Company, and from other testimony, that cipher messages giving the price of coffee sent from Rio to the New York Coffee Exhange, and to a large coffee house in this city, on Friday last, were delayed in delivery until the following Monday. There was no date on the cablegrams to show when they had been sent. In the meantime two days' quotations had been received here before the delayed messages came to hand, so that when Monday's dispatches appeared to show a difference of about two cents a pound in the quotations for coffee there was confusion worse confounded. If the telegraph company in delivering the delayed messages had made a proper explanation the trouble would not have occurred. A committee of the Exchange is to report on the subject at once.

A Little Scene in Philadelphia.

Over the grass, across the walks filled with promenaders, fifteen electric globes among the tree-tops illuminated Franklin Square. In the circle little groups gathered to watch the play of light on the water of the fountain, and two elderly citizens denounced the authorities for neglecting to replace the seats, from which they could have enjoyed the spectacle. Between two trees, one of the dazzling white globes hung close to the ground. "Och, Mary, come an' look at the thing," said the younger of a party of three girls approaching the lamp.

"An' did yez iver see the loike, now?" said Mary, who stood in open-mouthed astonishment before the thing.

Flicker, flicker went the light, and when the burning carbon fell, amid a shower of sparks, a chorus of screams went up from the stampeding girls, and the one-legged bootblack, who had been a silent spectator, stumped off muttering:

"I heard tell o' people stoppin' a clock, but that there woman put an electric out."

THE
ELECTRICAL WORLD,
PUBLISHED WEEKLY AT
No. 9 MURRAY STREET, NEW YORK.

W. J. JOHNSTON, Editor and Publisher.

NEW YORK, OCTOBER 20, 1883.

CONTENTS.

ILLUSTRATED ARTICLE: Page.
The Exhibits at the Telephone Convention.....115, 116, 117, 118, 119, 125, 126, 127
EDITORIAL:
The Cuts are in this Issue !..... 122
Activity in Cable Laying..... 123
The Telephone Convention..... 123
Swinging Round the Circle 123
Tapping the Wires..... 123
The Bankers and Merchants' Extension..... 123
MISCELLANEOUS:
The Electric Light Fire Risks..... 120
The U. S. at the Vienna Electrical Exhibition..... 120
Electrical Studies..... 120
Electrical Studies at Yale..... 120
The Life of a Carbon Changer..... 120
The Telephone in Springfield, Mass..... 121
Use of the Light in London..... 121
The Alleged Luminosity of Magnets..... 121
Electricity in Newburyport Mills..... 121
The Origin of Lightning..... 121
Conflicting Cable Messages..... 121
A Little Scene in Philadelphia..... 121
New Cables..... 123
The New Produce Exchange..... 123
Electric Storms at Sea..... 123
The Edison, Blake and Drawbaugh Patents..... 124
Telephonic Consolidation..... 124
Swindling the Pool-Sellers..... 124
Western Union Telegraph Suits..... 124
The Brush Light in the South..... 124
DEPARTMENTS:
The Telegraph..... 127
The Telephone..... 127
The Electric Light..... 128
Miscellaneous Notes..... 129
Electrical Patents Issued..... 129

NEW ADVERTISEMENTS.

The Electrical Supply Co.—Diamond Carbon Battery, Telegraph, Telephone and Electrical Supplies..... 131
Charles Williams, Jr.—Williams Telephone Switch-Board, Magneto Bells and Telephone and Telegraph Apparatus... 131
The Stabler Signal Co.—The Stabler Individual Call..... 135
Standard Electrical Works.—Post Magneto Bell, Improved Telephone Switch-Board, Telegraph, Telephone, Electric Light Wire and Supplies..... 135
Boulton Carbon Works.—Carbons for Electric Light Purposes 135
Western Electric Co.—Telephone Specialties, Standard and Multiple Switch-Boards, Gilliland and Williams Magneto Bells, Patterson Cables, Insulated Wires, Batteries and Apparatus for Electrical Measurements..... 137
Utica Fire-Alarm Telegraph Co.—Palmer's Telephone Switch-Board, Ahearn's Lightning Arrester, Telephone and Telegraph Instruments and Supplies..... 138

To make room for the elaborate report of the Telephone Convention, without crowding out our regular supply of miscellaneous electrical reading matter, we find it necessary—in keeping with our desire to rise to every emergency—to issue a 24-page paper to-day.

THE CUTS ARE IN THIS ISSUE!

The recent telephone convention gave THE ELECTRICAL WORLD two good opportunities of once more demonstrating its enterprise, energy and pluck. Need it be added that both were taken full advantage of?

In the first place it is a feat we are proud of that we are able to-day to present so full, complete and valuable a report of a convention that took place 756 miles away on Tuesday and Wednesday of the present week. Two representatives of this journal visited the convention. One, the associate editor, devoted literally every moment of Tuesday particularly to familiarizing himself with the various exhibits made at the convention, especially with reference to new features. From the time he ate his breakfast, early in the morning, he stopped neither for food nor for anything else until 6:30 P. M. By that time he had a book full of notes. Not even waiting for supper, he took the omnibus, then at the hotel door, caught the fast train for New York on the Pennsylvania Railroad, wrote out what he could of his report on the way, and the result is seen in to-day's issue.

The other representative, the publisher, remained behind to look after such matters as might need attention. As it turned out, that was an exceedingly judicious thing to do, as will be seen from the following little narrative of triumph over unsuccessful scheming. We will endeavor to relate the circumstance as well as we can, with the train bumping along New Yorkward at the rate of thirty miles an hour.

Several weeks ago, with true journalistic and business forethought, the publisher of THE ELECTRICAL WORLD wrote several leading manufacturers of telephone apparatus, explaining how the paper desired to furnish its readers, in its issue of the week the convention occurred, with a full report of the proceedings. He pointed out the way they could each co-operate with him, to mutual advantage, by having cuts made of all that was new and important in what they were respectively to exhibit at Cincinnati. Of course every manufacturer appreciated the benefit it would be to him to aid us in the matter.

There was only one hitch, and it occurred in a way that warrants us, we think, in speaking of it here. The officers of a very important manufacturing company that had been written to, when called upon Monday, said that a number of new cuts of theirs had just been finished; they were using them in pamphlets then in the hands of the printer, but would give us an order for advance sheets, and we could then see just what the cuts were; all or such as we desired would be sent us at once. The selection was made and assurances given that not a moment of unnecessary time would be lost in forwarding the cuts to New York. In that confidence we went ahead and prepared the report in the manner spoken of above. It was not until Wednesday evening, after the convention had adjourned, that we heard anything more about the cuts. Then the information was communicated that a representative of the company had promised the first use of these cuts to another paper; the head of the company was sorry that such was the case, but he thought it best to confirm the action of his associate.

The publisher suggested that perhaps the cuts had already been sent, as the arrangements to send them had all been completed two days before, unless somebody had telegraphed in the meantime countermanding the order. The manager had not done any telegraphing in the matter himself, but—ahem!—he did not think the cuts had gone forward. A telegram to the office brought a reply which confirmed the manager's opinion.

THE ELECTRICAL WORLD has not been beaten so far in anything where enterprise, expense and pluck were involved, and, as a matter of course, we could not allow ourselves to be thwarted in this way. There was only one alternative. The manager was told that we simply must have those cuts, and that we had to have them in this week's issue. If he would not furnish us with them, he, of course, would not object to *our making cuts of our own*. He said he would not, and expressed admiration of the pluck which suggested such a solution of the matter. In a very short time a telegram was on its way toNew York, with instructions to have our own engravings made, the men working night and day if necessary to get them out in time, and no exertion or expense to be spared to that end.

The time was short and the weather unfavorable, but through the united efforts of a dozen different engravers, all of whom worked far into each night, the cuts were made, and they are in this issue! We were put to considerable unnecessary annoyance and expense, but we come out first with the cuts, as we generally do.

THE ELECTRICAL WORLD always welcomes competition. Its conductor has been in electrical journalism for almost a decade, and he believes that, with the staff he has gathered around him, he can furnish a paper of more practical value to the electricians of America than can any one else in the wide world. His aim is to make THE ELECTRICAL WORLD the best electrical journal published, and he will not be satisfied short of that. In view of its excellence and of the very low subscription price, the paper has made rapid strides; and never in its history has its progress been so marked as during the past month or two. We have competitors, and are glad of it. Competition spurs us on to increased effort, and in this way is a great boon, both to the paper and to its readers, as well as to the cause of electrical journalism in America.

Besides, with several papers in the field there is much more activity, both in the matter of subscriptions and of advertising, than if one journal had the monopoly. There is also more incentive to push forward, with a view to getting ahead of your competitors.

Our experience has always been that competition was beneficial to us. For that reason we don't care to disparage competitors. We are rather inclined to encourage them. When foreign journals say bitter things of them, or ridicule the lack of electrical knowledge displayed by their alleged editors, we sympathize with our less experienced contemporaries. Were we inclined the other way, and sufficiently destitute of those qualities which mark the gentleman, we might perhaps delight in reprinting such "complimentary" notices. When a correspondent, in beginning a letter for publication, praises this paper and runs down the others, or any of them, we cut that part of his communication out.

Not even when we score what newspaper men call a "beat," by getting a week or two ahead of every other paper on some important matter, do we as a general thing mention it in these columns. A reporter of the *Herald* once called to hunt up something in a back number. "It was important and was published in full by you long before any other paper had it. I think, therefore, that you ought to remember the article," he said. He was told that as this occurs almost every issue, it was impossible to recall that particular instance.

For two consecutive weeks we have given cuts and descriptions that the "enterprising" periodical which endeavored, by the means we have stated, to steal a march on us came along with in its issues of the respective following weeks. In the first of these instances, we had a three-page *original* article, written from the American standpoint, and gave thirteen illustrations in it. Our contemporary, the week following, gave just one illustration and a mere *translation* from the original source, covering but a little more than a page. The subject was therefore treated from a foreign standpoint and, of course, was not very valuable to Americans. These two are by no means the only cases in which we have got ahead of the same paper. We should probably not have mentioned them, however, had the subject not come up as it has. Of course it is natural that our would-be rival should try to return the compliment.

It does its best to follow our example in everything where little or no expenditure of money is involved. When it started, it took the exact size and form of our paper. When we changed to a weekly and enlarged the size of the page, it did the same. When we introduced two volumes a year instead of one, it made a similar announcement in the very next issue. Not infrequently it copies from us—we can nearly always tell matter copied from THE ELECTRICAL WORLD by reason of the fact that so much of our contents is original—and has had for many months an advertisement of binders every word of which we wrote for THE ELECTRICAL WORLD before it followed our example of having binders made.

So far as competition is concerned we would not object to it in the least, if the means used are straightforward and aboveboard. Fair and square competition no honest journal need fear. It will be all the better for it in the long run. Integrity and merit are always appreciated in journalism as elsewhere, and a journal worthy of the name is not afraid to let the public judge between its contents and those of any competitors it may have.

For these reasons, we look with complacency upon all new ventures intended to crowd us out of journalism, and are more inclined to give them a word of encouragement when occasion offers than to find fault with them. We have no desire, in fact, to say anything in these columns to wantonly hurt the feelings of anybody. We would rather say pleasant things, or else keep silent. When we do say something not very complimentary of an inventor or a device, or—if we ever do so—of a competitor, it is wholly from a sense of journalistic duty.

When a competing paper is started, however, those connected with it almost invariably begin by abusing us. They seem to think that if they could only get this journal out of the way there would be some chance for them, just as new parent telephone companies attack the American Bell, and new telegraph exterprises make an onslaught on the Western Union. These new papers commence quietly, and more particularly among advertisers, and make the most ridiculous and absurd misstatements. Some few, who are unacquainted with this paper, are credulous and for a time believe; but they soon learn that they have been deceived. After a while our would-be competitor openly abuses us in print, and resorts to all kinds of questionable efforts to outwit us. It continues this abuse until it dies; the nearer the approach of dissolution, the more vehement the denunciation.

In the meantime we keep on in the even tenor of our way, satisfied with the progress we are making and confident that whatever papers may come or go THE ELECTRICAL WORLD will gain strength as it advances.

This confidence is founded on the belief that everybody in this country who wants an electrical journal will take

THE WORLD, by reason of its preëminent value and the exceedingly low subscription price, and that advertisers will, therefore, find it more profitable, more satisfactory and more economical to make their announcements through a journal covering the entire field than through several, each reaching but a few subscribers.

We would not get any more subscribers or any more advertisements if we had no competitors, and there is no reason why we should be ill-natured about it, and feel annoyed because another paper appears to contest the field with us. Even if peradventure it should succeed in paying expenses, does that take butter off our bread? Not at all. We like competitors. There is lots of room in this country for electrical journals; only THE ELECTRICAL WORLD will try to be better and cheaper and more enterprising than any that may enter the field.

Activity in Cable Laying.

In spite of the allegation that there are already too many cables between this country and Europe, capitalists are investing their money freely in new cables that are promised to give a better and cheaper service. A number of leading business men of New York, chiefly members of the Produce, Cotton and Stock Exchanges, have formed a company to lay cables for direct communication between New York and Liverpool at a charge about half that now exacted. Nearly all the money is assured, contracts are in negotiation for two cables of a new type, superior to any before manufactured, and guarantees against amalgamation and pooling are to be provided. The primary aim of the company is to facilitate commercial operations. The president of the new organization is Thomas L. James, ex-Postmaster General, and among the directors are David H. Bingham, of David Bingham & Bros.; E. R. Livermore, of E. R. & R. B. Livermore; John H. Hebbert, of Hebbert & Allen; A. D. Straus, of A. D. Straus & Co.; John F. Plummer, of Pomeroy & Plummer; E. A. Quintard, president of the Citizens' Savings Bank; W. H. Guion, of Williams & Guion; and A. H. Rice, ex-Governor of Massachusetts. Mr. J. C. Hueston, of No. 170 Broadway, will be secretary.

At the same time announcement has been made in the papers that James Gordon Bennett and J. W. Mackey signed a contract last month with the Siemens Brothers for two transatlantic cables, which are already in process of construction at the works of the firm near London. The first of these cables is promised about the 1st of June next year, and the other not much later. It is said by those who claim to be well informed on the subject that no less a sum than six million dollars has already been subscribed. These new cables are likely, it is said, to be operated in connection with the lines of the Postal Telegraph Company and the Baltimore & Ohio Company. It will be remembered that Mr. Mackey is president of the former company. The following is the statement of the *Herald* as to its position in the matter:

"This cable enterprise will be an essentially American one. These cables will be owned entirely by Americans, and this will be the only American company owning cables under the seas between England and America. As America does not own anything that runs over the Atlantic, owing to our Chinese legislation regarding ships, it is high time to put something American under it which legislation cannot touch.

"The cables are being constructed by Siemens Brothers with the greatest possible care and with all the latest improvements pertaining to modern electrical science. The policy of the company to be organized will be to maintain the absolute secrecy of messages intrusted to it, to forward and deliver them with the utmost rapidity, to charge only a fair tariff, thus meeting the present demand for economy, and to regulate its whole administration on sound, common-sense business principles.

"As these cables are being constructed to meet an actual and urgent need, and not for speculative purposes, the public may rest assured that the management will not fall into the hands of any ring, and that the stock will not be tampered with by any process of watering for the benefit of the promoters, nor be pooled with that of other cable companies.

"We believe it is for the interest of all—bankers, merchants, newspapers and the public in general—that there should always exist a healthy competition in cables as in other things, and we are convinced that there is business enough both for our enterprise and for that of the present cable ring."

Cabling will be cheap in the near future.

The Telephone Convention.

The fourth annual convention and the fifth meeting of the National Telephone Association was held at the Gibson House, Cincinnati, on Tuesday and Wednesday of the present week, the 16th and 17th inst., and proved to be a most pleasant and interesting reunion. There has been in some quarters a feeling that the annual meetings were no longer required, and that as the telephone is so largely controlled by one powerful organization, the members of the association would gradually become fewer and would have ttle to tell each other that was new and important. Indeed, before the present gathering, there were those who predicted that the Cincinnati convention would be the last meeting of the association. While many changes have taken place since the association was formed, and some of the reasons for establishing it no longer exist, still, much good is derived from these conventions, and we are glad to see that no radical change has been made in the association. It is probable that as time goes on some changes will be introduced, but it is not likely that the association will be abandoned. As will be seen from the subjoined report, the attendance at the present convention was excellent, and the exhibits and discussions brought many valuable facts to light and prominence. A moment's consideration will show that this must be so, and that every year the progress of telephony will lend additional weight to the deliberations of the convention. A man in subscribing for any good technical journal may not feel that he is getting his money's worth every issue, but at the end of the year he will freely admit that his outlay has been returned to him many times over. So, too, an electrician, a telephone manager or a manufacturer may not, within the next few weeks, be able to point to any particular instance in which the expense incurred has been made up to him or to his company through the knowledge he acquired from participation in these proceedings, but as the months roll on his ledgers or his greater facility in practical work will show that much direct good was derived. Impressions received insensibly have deepened and operated. Hints hardly noticed have later on flashed out like warnings or guiding beacons, and the ultimate experience is one that no active, enterprising, thinking man would willingly lose.

The local committee of arrangements on this occasion was composed of Capt. G. A. Stone, first vice-president of the Cincinnati City and Suburban Telegraph Co., and Mr. E. V. Cherry, of the Standard Electrical Works, and with them Mr. A. D. Bullock, president of the City and Suburban, acted, supervising the arrangements to make the delegates comfortable. Several other local telephone men also rendered valuable assistance. The convention was held in the front parlors of the Gibson House, on the first floor. On the same floor could be seen the interesting exhibits, described elsewhere in our columns, of the most recent novel and important inventions and appliances in telephony.

Swinging Round the Circle.

Of the eight nights ending with Thursday last (Oct. 18) the publisher of THE ELECTRICAL WORLD passed six in sleeping cars, visiting five different and widely-separate cities. The other two nights were spent in hotels. Most of the time the associate editor accompanied him, and shared with him the "comforts" incident to travel. Both men are averse to saying anything in print that might look like blowing their own trumpets. Indeed, each has the reputation of being—for a newspaper man—more or less of a retiring disposition. They met with so much genuine warm-hearted Western hospitality during their journey, however, and made so many pleasant acquaintances in each of the cities visited, that they cannot resist the impulse to say here how much they appreciated, and will continue to appreciate, the many kindnesses shown and thoughtful attention paid them wherever they made themselves known. The interest taken everywhere in THE ELECTRICAL WORLD—as was apparent from the pleasant things that without exception every one who mentioned it had to say of it—was, we need hardly say, exceedingly gratifying to us, and will encourage us to strive still more to deserve the compliments we received. We hope to be able to renew the friendships made in the West, and to be able to reciprocate the kindness when those we met shall visit the Metropolis.

Tapping the Wires.

Great excitement was caused on Saturday, the 13th, and subsequent days, in sporting circles throughout the country, by the supposed tapping of telegraph wires between Jerome Park and this city. In three or four of the announcements of results of races the names of the winning horses were falsely given, and pool-sellers everywhere are said to have been badly swindled, paying away not less than $100,000.

At first it was asserted that the lines had been tapped, but as far as we are aware, no signs of cutting have yet been discovered; and the Western Union Company treats very lightly the idea that it can be held responsible for the losses. A belief prevails in many quarters that the scheme was worked out by connivance with the operators, of whom some people are only too delighted to make scapegoats. The *Mail and Express* says: "The two operators employed by the company at Jerome Park and the two receivers at the main office are old and reliable men, and it is not believed that they were in any way implicated in Saturday's transaction. It is the general impression among pool men that the scheme was planned and worked by sporting men living in this city who knew the ciphers and were familiar with the inside system employed by the bookmakers. That there were several engaged in the swindle is considered certain from the fact that their confederates in the different cities acted in concert and simultaneously in making the grand coup. As there are many first-class telegraph operators out of work it was an easy matter to secure the services of one or more in order to make it a success." One plausible theory advanced is that the pool men paid away the money to their own confederates or "put up the job" on themselves, and so deceived the persons who held winners' tickets, which would naturally be destroyed as soon as the result was published.

The case remains shrouded in mystery, but we give in another column some interesting details as to the game played since at Coney Island, by which dealers there have lost $15,000. We also publish some facts as to tapping wires in Chicago for market quotations.

The Bankers and Merchants' Extension.

We chronicle elsewhere the steps that are being taken to extend the system of the Bankers' and Merchants' Telegraph Company and push its business. One of the most important proceedings of the company of late has been to secure from the Secretary of State of Illinois a license to organize for work in that State. Warned by the experience of the Western Union Company, the new corporation has taken the precaution to forestall any evil-disposed citizens of Illinois who might harbor the thought or intention of stealing its name later, when it might be very profitable to do so. It is stated that the Bankers' and Merchants' Company will endeavor to control the line along the Nickel Plate road, now it has filed its articles of incorporation and is going ahead, and that it will by this means secure an entrance into Chicago. Developments will be anxiously awaited. Is the country at last to see a great telegraph corporation that can withstand the allurements and temptations that are offered it to become consolidated or amalgamated with the gigantic elder rival?

New Cables.

Speaking of its new cables the *Herald* of the 19th gives the subjoined particulars in a dispatch from London: Messrs. Siemens are energetically pushing the work on the new Mackey-Bennett cables, now being manufactured by them at Charlton Pier, Woolwich. They will form a duplicate line from Ireland to Nova Scotia, continued from Nova Scotia by special cable to Cape Ann, and having a branch line from Ireland to France. The work was definitely begun last week, and though materials are still being prepared and tested, yet it is already possible to determine the character of the cables.

Their core will contain a strand of eleven copper wires of the highest conductivity, weighing 350 pounds per nautical mile, and the dielectric will consist of eight coatings of gutta percha placed upon the wire according to the improved method of Messrs. Siemens, and weighing 300 pounds per nautical mile. The deep sea portion will be covered with galvanized steel wire and Manila hemp. All the intermediate cables are armed with steel wires. The shore ends are of the usual heavy types. Messrs. Siemens are convinced that nothing superior has ever come from their factories.

They will introduce all the improvements suggested by years of research and experience. The length of the entire system of cables will be 5,600 miles. They will be laid by the steamer Faraday in the course of next summer. A visit to the works, at Woolwich, shows that everything is in a forward state of preparation.

The New Produce Exchange.

The clock on the new Produce Exchange building on Bowling Green will be placed in the tower and will be the largest in the city. The dials are already nearly finished. The distance across the face from minute point to minute point is twelve feet. The distance between similar points on the Trinity Church tower clock is nine feet. The contract requires that the variation of time shall be less than ten seconds in a month. The tower clock will regulate the time of all the clocks in the building. It will be lighted by a powerful arc electric light suspended from a bracket in front of the dials.

All the telegraph, telephone and district messenger companies have placed their wires in this building, and connection will be made with each of the offices. The main room will, also, be connected by speaking tubes with each office, and tenants sitting in the offices can hold a conversation with their clerks on the floor. Three telegraph companies—the Western Union, Baltimore and Ohio and the Postal—will have offices in the building.

Electric Storms at Sea.

The steamship International, which arrived from Trieste Oct. 9, encountered two heavy electric storms during the voyage. The officers report that at 8 o'clock on the evening of the 3d instant an electric storm set in. It was comparatively calm, but lightning flashed in all directions, and lit up the sky as brightly as if it had been day. Only one peal of thunder was heard during the electric storm, which continued for nine hours. Last Saturday night the International encountered another electric storm. This began about 10 o'clock and continued until 3 o'clock next morning. Lightning flashes blazed in all directions. The sea was not heavy, the wind was not high, and there was no thunder. Electricity ran down the rigging and along the railings. The officers could feel it running down their arms. Their fingers frequently tingled as if they had touched a galvanic battery. The sky was kept constantly ablaze during the whole storm.

The Edison, Blake and Drawbaugh Patents.

A dispatch from Washington of the 11th inst. says:

Secretary Teller concluded to-day the hearing in the interference cases of the Edison, Blake and Drawbaugh telephone patents. A large number of patent lawyers and telephone capitalists were present, and arguments were made by Roscoe Conkling for Edison, Mr. Howson, of Philadelphia, for Blake, and Mr. Hill, of Chicago, for Drawbaugh. Mr. Conkling was sarcastic, as usual, but no displays of ill-temper were made. The case is simply a contest between the Bell Company, which owns the Blake and Edison patents, and the People's Telephone Company, owning the Drawbaugh rights. Drawbaugh has not succeeded in getting a patent, while the others have, and if they show that his idea is an interference with theirs, he cannot get a patent. Commissioner Marble decided that Blake and Drawbaugh interfere, but that Edison and Drawbaugh do not. Drawbaugh appealed from the first decision and Edison from the second, for the Bell Company that Drawbaugh is in interference in both cases. They claim that if not with a patent of Edison's he is with another of Blake's. Telephone models and telephone talk filled the secretary's room to-day, and all the lawyers gave a history of telephonic progress, Mr. Conkling claiming that Edison was the father of the muffler for the receiving diaphragm and Mr. Hill assigning the honor to Drawbaugh. If the latter is not sustained by Secretary Teller his case falls to the ground. If he wins on the interference question then the Bell Company will make another contest on the issue of priority. Secretary Teller was in his office to-night studying the papers. He says he will give his decision inside of 10 days. This is the third year of the Drawbaugh-Blake controversy in the Patent Office. This hearing, the result of which will sustain or disprove the claim or Daniel Drawbaugh to the most important features of the Blake transmitter used by the Bell Telephone companies, is of very great importance to all concerned. It is stated that Drawbaugh unquestionably applied for these particular patents within two years' time. Should he prevail in this particular interference matter all the transmitters now in use would practically be tributary to him. This interference contest, with reference to the dampener round the diaphragm, which is essential to all good transmitters, is in no way connected with the Drawbaugh suit now pending in the southern district of New York, in which the commissioner, appointed by that court, will begin to take testimony about Nov. 20.

According to a dispatch from Washington last Wednesday, December 11 is assigned for the hearing of the great telephone cases, in which the priority of the several telephone patents is to be determined before the examiner-in-chief of the patent office. The evidence fills five printed volumes. At least two weeks will be taken up by arguments, at which all the ablest patent attorneys in the country will appear. Whatever the decisions may be, the cases will be appealed to the Secretary of the Interior. Another dispatch says that the recent statement from Washington concerning the Drawbaugh, Blake and Edison telephone interference was incorrect in its inferences. The fact is that the motion argued was not vital or final as regards the Drawbaugh claims. The motion was make by Drawbaugh's counsel to dismiss the interference of Blake, on the face of the matter, without taking evidence. This is the question which the Secretary of the Interior has to decide. If Drawbaugh wins and Blake's interference is dismissed, it is a substantial victory, and makes the present transmitters in use tributary to Drawbaugh. If Drawbaugh's motion is overruled it simply means that he must put in his evidence, so as to substantiate his claim to have been the first inventor of the transmitter now claimed by Blake. Edison's claim being thrown out by the commissioners, he appeals to be placed in the interference.

Telephonic Consolidation.

The terms of the consolidation of the American Bell Telephone Company's local interests with those of the New England companies controlled by the Lowell syndicate are published. The companies with which the Bell Telephone Company is to consolidate are the Boston and Northern, the National Bell, of Maine; the Surburban, the Bay State, and the Granite State. The new company is to have a capital stock of $12,000,000, and it is to be distributed as follows: National Bell, of Maine, $1,350,000; Boston and Northern, $980,000; Bay State, $840,000; Surburban, $603,700; Granite State, $121,500; Boston (for property, etc.), $1,947,600; American Bell, $4,058,400: making a grand total of $9,901,200. Of the balance of $2,098,800 of stock remaining in the treasury $1,238,300 is to be sold for working capital and $860,500 given to the American Bell Telephone Company for the franchise. The American Bell Telephone Company is to sell and the new company is to buy Boston for $1,947,600 of stock, for the plant, property, etc., and $1,947,700 of stock for the franchise. Licenses in perpetuity for exchanges, for extra territorial connecting lines and for a supply of telephones for private lines, or other purposes, will be issued by the American Bell to the new company for the States of Massachusetts, Vermont, New Hampshire, and Maine, excepting such parts thereof as are now under contract to other parties than those above mentioned, such exception, however, not to include the city of Boston, on further condition that the new company enters into a contract with the American Bell to give it in consideration of the licenses above mentioned 50 per cent. of any increase in its capital stock above $12,000,000.

All stock which the American Bell Company is to receive is to be fully paid up, and not subject to any assessment or contribution. The new company shall not, without the consent of the American Bell Company, borrow money for the purpose of extending or developing its business. The new company is to assume and pay all State, county and other taxes on account of or by reason of the instruments or the business done under said licenses. This, however, is not to be done unless the corporate franchises of the American Bell Company are assessed by the State of Massachusetts. In case the new company shall arrange to acquire new licenses in New England, the American Bell Company will add the territory covered thereby to the licenses proposed to be given to the new company, it being understood that such acquisition shall be made by an increase of the capital stock above $12,000,000. and that the American Bell Company is to receive 50 per cent. of such increase, except in case of the acquisition of licenses issued in perpetuity by the American Bell Company, provided, in case of the purchase of the licenses and properties of the Southern New England Telephone Company, that the so-called inter-state license, in so far as it relates to lines connecting with points outside of New England, shall be surrendered to the American Bell Company, it being the object to confine the licenses to lines both ends of which are in New England. All branch line contracts made by the American Bell will be given to the new company for the simple payment of rentals, less a discount of 30 per cent., and the new company will have exclusive right to use or rent telephones for all purposes, except for the transmission of general business messages, market quotations, or news for sale or publication. Stock dividends are to be paid as follows: For the quarter ending Sept. 30, 1884, on $720,000; for the year ending Sept. 30, 1885, on $1,320,000; for the year ending Sept. 30, 1886, on $1,920,000; Sept. 30, 1887, on $2,520,000; Sept. 30, 1888, on $3,120,000; Sept. 30, 1889, on $3,720,000: on Sept. 30, 1890, on $4,320,000, and Sept. 30, 1891, on $4,918,900.

Meetings on the 17th of stockholders of the Suburban, Bay State, Boston & Northern Telephone companies voted unanimously in favor of consolidation with the National Bell Telephone Company.

The meeting at Lowell on Wednesday of the stockholders of the Suburban, Bay State, Boston and Northern Telephone Companies voted unanimously in favor of consolidating with the National Bell Telephone Company.

The stockholders of the Granite State Telephone Company at Manchester, N. H., on Friday, Oct. 19, voted to consolidate with the other New England companies and the Boston Exchange, the Connecticut and Providence companies not included.

Swindling the Pool Sellers.

Another telegraph wire-tapping scheme was discovered on Tuesday afternoon, says the *Times* of the 17th, this time at Coney Island, by which pool-sellers and patrons of pool-sellers at that place were swindled out of about $15,000. For some time past Mr. Albert Burtis, owner of the pool-room at Paul Bauer's, had observed that notices of the time for races to begin at the various courses, sent him by his correspondents on the grounds, have been coming in from 10 to 20 minutes late. Mr. Burtis felt certain that the delays resulted from no fault of his correspondents, and suspected that some persons were tapping the wires and withholding the information, but until within a day or two he has been unable to ascertain who those persons were.

Another fact Mr. Burtis had noticed was that two men, Harry Furst, of this city, and Alexander R. Samuels, of Brooklyn, since these delays began, have invariably named and won upon the winning horses, betting upon them at the last moment before the pools were closed. From this fact he suspected the two men of being the persons who interfered with the wires. He employed men to watch their movements, but no proof of their guilt could be obtained. Finally, on last Monday, a boy employed about the pool-rooms came to Mr. Burtis and told him that Furst had come to him and asked him if he did not want to make some money. The boy said he did, and Furst then told him that he (Furst) had some telegraph instruments in the Iroquois Club-house, and that if he (the boy) could get hold of the cipher dispatches sent to Mr. Burtis naming the horse first past the post, it would be made worth his while. The boy came to Mr. Burtis to know what he should do. Mr. Burtis told him to tell Furst that he would get the dispatches, and he would look out for the rest. Mr. Burtis then informed Chief McKane, of the Coney Island police, of his discovery, and asked for a warrant for the arrest of Furst and Samuels. The latter, Furst had informed the boy, was his partner. For some reason the warrants were not granted until Tuesday, and in the meantime Furst and Samuels having, through some means unknown to Mr. Burtis, obtained information of the application for the warrants, had quietly taken their departure. They must have left in rather a hurried manner, for when the Chief and five policemen visited the Iroquois Club they found in a room on the third floor, formerly occupied by them, all their swindling paraphernalia, consisting of two new telegraph instruments and five batteries. The room presented a most disordered appearance as regards furniture, and there were a number of telegrams lying about upon the floor. These telegrams were announcements of winning horses in the Washington races. The instruments and batteries were taken charge of by Chief McKane and conveyed across the way to Police Headquarters.

The method by which these men worked their swindling operations was very simple. The wires from their instruments were joined to the trunk wires outside running to the pool-rooms at Bauer's. Three dispatches are always received at the pool-rooms about a race, the first announcing the time at which the race is to start, and at which the pools are closed; the second, in cipher, announcing the name of the horse first passing the post, and third, the judge's decision. The swindlers would intercept the first dispatch, keep it until the last was received, alter the time 10 or 15 or 20 minutes, and then send it along. Then, having received the name of the winning horse, they would instruct their operator to send it along in 20 minutes, and then go out and bet upon the race, and, of course win every time. Furst was the man who did most of the betting, Samuels rather keeping in the background. Mr. Burtis and his partner, Paul Bauer, have lost about $12,000 through these operations, and the patrons of the "Jumbo"—next door—have lost probably $3,000. The Jumbo has no telegraphic communication, but closes its pools when those of Mr. Burtis are closed. It is said that Furst and Samuels paid their operator $500 per day for his work. The operator's identity could not be established.

Furst met Mr. Burtis' cashier, who then knew nothing of the swindle, on Tuesday night, in this city, and informed him that he intended going West. Both he and Samuels have since then been arrested, however. Both men have long been known among sporting men, and have always been looked upon as rather "slippery" characters.

Western Union Telegraph Suits.

Counsel in the matter of William S. Williams against the Western Union Telegraph Company appeared before Judge O'Gorman at the Special Term of the Superior Court on the 13th inst. on an order to show cause why the injunction against the paying of the dividend of the Western Union Company should not be vacated and set aside. Gen. Wager Swayne, representing the company, urged that there was no longer any necessity for retaining the injunction, in view of the recent decision of the Court of Appeals in this case. Mr. Robert Sewell, on behalf of the plaintiff, stated that he was not willing that the moving affidavits, which asserted that the Court of Appeals had decided the whole controversy, should go on the records of the court uncontradicted. He filed an affidavit of Mr. William's attorney, setting forth what that side regarded as the exact position of the controversy. In the original case against the Western Union Company and 31 of its Directors, a judgment was had in favor of the validity of the issue of the stock. This judgment was reversed by the General Term of the Superior Court and a new trial was ordered; from this order of reversal the Western Union Company as a corporation appealed to the Court of Appeals, but none of the other 31 defendants had appealed.

The plaintiff took the ground that the case yet remained to be disposed of on the question of fact as regarding the 31 defendants who had not appealed, declaring that it was therefore apparent that the controversy was not ended, and that the question of fact would have to be tried anew, either by one of the Judges of this court or by a jury, on issues framed for that purpose. Mr. Sewell said he would withdraw his opposition to the vacation of the injunction if Gen. Swayne would strike out from the order which he had prepared the clause asserting that "it appeared to the court that the Court of Appeals had finally adjudicated that the stock of the Western Union Company in dispute was legally issued." Gen. Swayne immediately consented to the suggested alteration, and the order was entered vacating the injunction.

The Brush Light in the South.

Mr. William T. Smith, secretary of the Brush Electric Company, returned to Cleveland last week from an extended tour of the South, and reports very satisfactory progress making in that region. He says: "The Brush lights at Nashville are under the superintendence of T. P. Keck, an old Cleveland boy, and are giving great satisfaction. In fact, at Nashville, Memphis, Chattanooga, Montgomery, Macon, Savannah, New Orleans, Louisville, and elsewhere throughout the South there are flourishing local Brush companies established, which are doing finely. Some of these companies have city lighting contracts in addition to a large amount of railroad and private lighting; others expect to secure city contracts at an early day. At Evansville, Ind., the effect of the tower lights as our boats ascended the Ohio River from Henderson, Ky., in the evening, was magnificent. The people of Evansville are so well pleased that the Council will complete the lighting of the city by means of the Brush system, ordering at once forty additional lights on arches, and extending the present five years' contract with the Evansville Brush Company to ten years. The Brush storage batteries that have been sent South have captivated the people. I never saw a finer small display of incandescent lighting than that from the Brush battery at the Maxwell House, in Nashville, Tenn."

(*Telephone Convention, continued from page* 119.)

being below the spindle which extends from one end to the other and which can be turned by a crank so as to ground all the lines. Last but not least, we must mention the Stabler individual bell call, which attracted considerable attention in this exhibit. This method of individual signalling is founded on step by step motion, with special devices for synchronizing, etc., and it seems to work very satisfactorily indeed. The calling apparatus (Fig. 27 placed in the central office can be used for all the lines. It consists of a generator operated by a treadle, and having two circuits, one giving alternating currents and the other giving impulses continuous in direction but of greater power. The subscriber's apparatus (Fig. 28) carries an index moved by the impulses acting on a polarized magnet similar to that which moves the index in the calling apparatus. The calling apparatus is provided with a number of buttons arranged in a circle and numbered, each of which corresponds to the number of a subscriber except two, marked unison and index. There were six stations in operation, and the working of the system was a complete success. On pressing the number required, the hands moved together at all the stations until a certain point and then by touching a special button the bell desired was rung. We cannot do full justice to this ingenious invention in this limited space, but hope to return to it at an early date with a complete description.

UTICA FIRE ALARM TELEGRAPH COMPANY.

This concern had a fine exhibit of its specialties, among which one of their switchboards (Fig. 29), which has the merit of great simplicity of construction and of operation. The Palmer spring jack is used. This spring jack is rotary in character and is shown at the right. The line enters the switch-board through a lightning arrester (Ahearn's patent, recently described in THE ELECTRICAL WORLD) and passes down to the small table where it passes through an ordinary spring jack. These spring jacks are not shown in the cut, but we have added a diagram of one below the table. It consists of two parallel springs *d e*, to one of which is fastened a pin *n* that normally makes contact between the two. The line enters at *e'* and leaves at *d'* to go to the Palmer jack, which it enters at *g*. There are two plug holes *J J*, either of which may be used. When a plug is inserted, the brass piece turns on the screw and

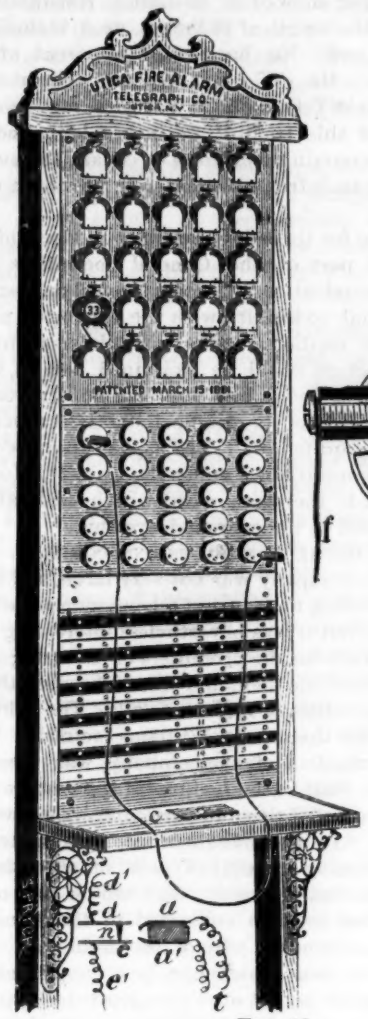
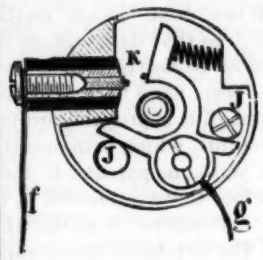


FIG. 29.



opens the circuit at *k*, the line *f* being connected to an annunciator and to the ground. When there is no plug therefore the circuit of the subscriber's line from the lightning arrester is to the spring jack, to the Palmer jack through contact *k* to wire *f* to the annunciator to the ground. When the annunciator is dropped the operator loops her telephone in at the spring jack *d e*. The plate *c* on the table is connected with the generator. To call the subscriber wanted she takes a pair of plugs connected by flexible cord, inserts one in the plug hole at *c* and the other into the Palmer jack of subscriber's line. This being done she pulls out the plug from *c* and inserts it into the Palmer jack of first subscriber's line, thus completing the connection between the two. Her telephone can be left looped in and she can thus determine when the conversation is ended. The parallel bars shown below the Palmer jacks serve to make the connections between the various tables on the well-known principle. This concern makes these switch-boards in various styles and combinations, including club switch-boards for any desired number of lines. An interesting modification consists in using studs instead of plug holes.

The exhibit of annunciators and burglar alarm indicators of all kinds for hotels, public buildings and dwelling houses, formed an interesting display. We regret, especially, that we cannot give more extended details concerning the burglar alarm system there exhibited to show the great perfection of its operation. We hope to return to this at a future occasion, however.

ELECTRICAL SUPPLY COMPANY.

This company made a very complete and interesting display of its numerous specialties. Among other things we noticed particularly the improved form of the "Diamond battery," which this company is now manufacturing and introducing as a substitute of superior merit, for the Leclanché and Law batteries. This battery consists of seven rods of carbon arranged in a circle and passing through a carbon disc, which connects them electrically together, one of the carbons being prolonged through the porcelain cover by a platinum wire and lead-binding post. The zinc is in the center of this "cylinder" of carbons and dips into a little glass cup containing mercury, so that the zinc remains constantly amalgamated. The ordinary sal-ammoniac solution is used. This battery is very convenient and possesses decided merits, as regards constancy and durability, and it is claimed to be the cheapest in the market. These are certainly great points in its favor that recommend it to the attention of telephone people generally. The American automatic lightning arrester exhibited by this company is an interesting device. The current is made to pass through an electro-magnet whose armature closes a grounding circuit when the amount of current exceeds the prescribed limits. This device is also especially useful where telephone lines are to be protected from electric light circuits and currents. The company makes all of its own copper wire, which has a reputation both here and abroad. A full line of office wires of all kinds, electric light and telephone wires covered and insulated, also appeared in the exhibit. The company owns the celebrated Eaton process for covering cables with lead in the very process of making them instead of drawing them into tubes. The insulation used is fire-proof and it is claimed the cables are more uniform in structure.

The exhibit included telegraph apparatus, vibrating bells, push-buttons, and a full line of materials used in general electrical work.

RHODE ISLAND TELEPHONE AND ELECTRIC COMPANY.

The little state of Rhode Island was far from lagging behind in point of representation in the exhibits. Indeed, we must say that Providence manifested her usual enterprise by contributing more than her share. The Providence people all took quarters in the same room and then placidly invited the rest of us who are not in the care of "Providence" to mend our ways by the following sign placed over the door:

"TRUST IN PROVIDENCE," (R. I).

There were evidently many of the delegates ready to "trust" these good people, for their exhibits were well patronized. The Rhode Island Telephone and Electric Company displayed two of their handsome and eminently practical switch-boards, one of which is illustrated in Fig. 39. This system of switch-board connection presents many novel features, on which we would like to enlarge fully did space permit. The Breckenridge spring-jack (Fig. 31), similar to the Snell jack of the Standard Electrical Works switch-board, is used for looping in the central office telephone. Its construction and operation will be understood from the figure. The line wires cross the connecting wires and connections are made between the two by inserting a plug split in four, which thus embraces both sides of each wire, forming a sure connection. We shall endeavor to give more complete details in a future number regarding this switch-board, which has proven so successful in operation at Worcester, Mass., and Providence, where the exchange comprises over 1,800 subscribers. The Wright patent cable clip (Fig. 32) was of special interest, because its construction is such that it greatly facilitates the suspension of aerial cables. The piece *D*, bent over the cable *E* is embraced by another folded piece *C* through which passes the S shaped hook *B*, by means of which it is suspended on the supporting line *A*. The upper end of the hook is in reality bent more to the right than is shown in the figure, which errs in this respect, so that the hook may be slipped over the cable without requiring to be unbent. The Howard Safety Appliance (Figs. 33, 34) also attracted much attention. This device combines a lightning arrester with a cut-out. It consists (Fig. 34) of a serrated disc connected with the ground, on which is screwed a switch-arm of insulated material, the two outer ends of which carry contact strips that establish communication in various ways between the six segments disposed around the ground disc. The appliance may be placed for

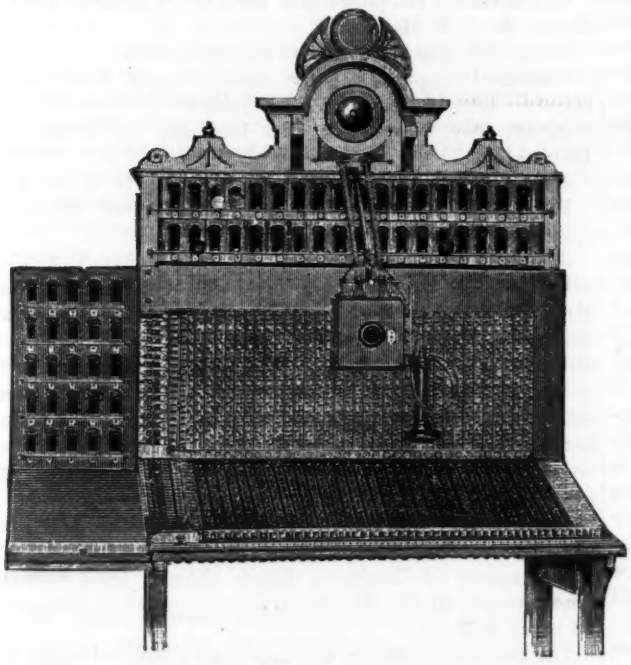


FIG. 30.

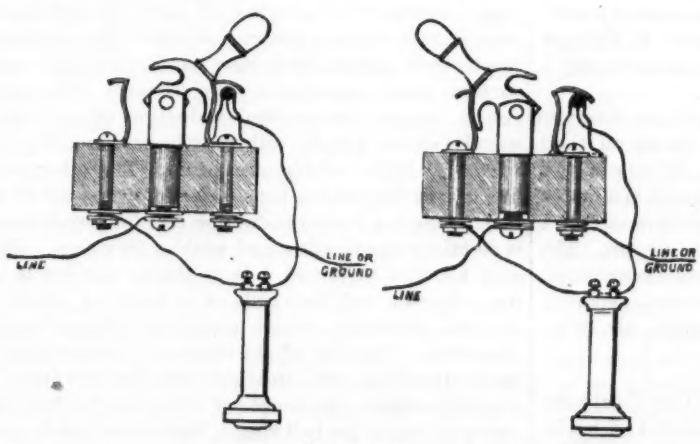


FIG. 31.

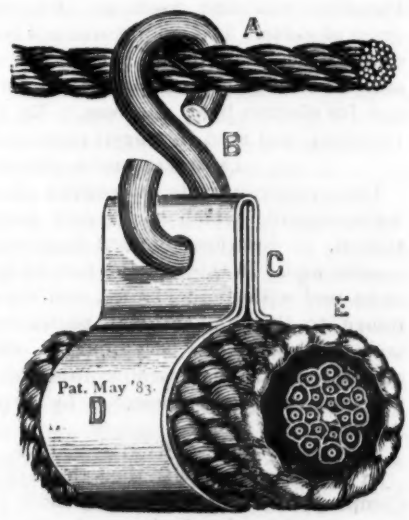


FIG. 32.

FIG. 33.

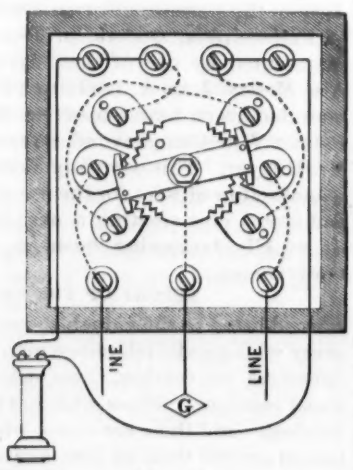


FIG. 34.

safety on the outside of the building and the switching arm may be moved from inside by means of a stem or spindle passing through the wall, and provided with a handle and pointer by means of which its position can at all times be determined. When the switching arm is in the position shown in Fig. 34 the line is short-circuited, but when the spindle is turned to the right so as to connect together the first and second segments on the left and the second and third on the right, the line enters the building and includes the telephone apparatus in its circuit. The dotted lines in the diagram explain the connections. Between the screws at the upper portion are pieces of fusible wire, which melt and open the circuit when the line conveys a current of greater volume than is esteemed safe. This fusible cut-out may come into use in preventing damage to the apparatus or the inmates in consequence of lightning discharges passing over the line wire or the electric light currents diverted by accidental crossing of the line with electric light circuits. Moreover, it will be seen that should the lightning discharge pass over the line while the telephone remains included in circuit the serrated disc in the centre affords all the protection of the ordinary telegraph line lightning arrester, because each of the segments is also serrated with its edge very closely approaching to the central or ground disc.

AMERICAN ELECTRICAL WORKS.

The American Electrical Works, of Providence, R. I., made a handsome and very complete exhibit of their justly celebrated wires in the same apartment with the company just mentioned. The exhibit contained reels of magnet and office wire of every description and an attractive display of flexible conductors, of which this concern makes a specialty. As a specimen of the fine magnet wires for which this concern claims superiority, we observed a reel containing five miles of No. 36 wire, Brown & Sharpe gauge (.005 in diameter), all in one continuous piece, the net weight being 30 ounces. A sample of No. 40 wire (.00315 inch diameter) in three pieces, weighing 12 ounces, was also shown. This wire looked as fine as flaxen hairs. The exhibit contained much of interest in the line of cables, which appeared in various types. Some of these cables were lead covered, but others were fibre-covered and hose-covered, with rubber lining the covering. A cable shown was made of fine relay wires drawn into rubber, which thus surrounded them on all sides. A multiple cable of 75 conductors for aerial lines made of silk-covered (No. 36) wires wound around larger wires, was one of the novelties, the larger wire being grounded to act as induction shields. Some of the cables also contained tin-foil wrappers between the stands to serve as induction shields. Paraffine was also used as the insulator in certain types of cable. The exhibit was not confined to telephone or telegraph line supplies, but it contained some excellent samples of large copper wire with different kinds of insulation for electric light purposes. Mr. Eugene F. Phillips, president, and Fred H. Angell represented this company.

LAW TELEPHONE COMPANY.

This company made an exhibit of the "Law Magneto Switch-board," which is a recent improvement on their system, as described in The Electrical World a few months ago. In this case the Law switch-board is adapted to be used with annunciators, and the system is in fact a return to the conventional switch-board system. The table exhibited could accommodate 500 subscribers' lines, and only requires six operators to attend to the connections. The company was repersented by its president, Mr. Wm. A. Childs.

AUGUSTIN G. DAY.

In the same room with the exhibit of the Law Telephone Company, Mr. Augustin G. Day made an exhibit of kerite covered and insulated wires and cables of all kinds. There were samples of insulated copper and iron wires of all sizes for telephone and electric light purposes both. Telephone cables, both aerial and subterranean, or submarine, and also armored cables were shown in sample. The exhibit also contained some nice samples of kerite tape. Mr. C. B. Hotchkiss, general agent, represented this house.

LYNCH & BANTA.

This house, represented by Col. S. G. Lynch, are agents for the Dorsett underground conduit, which was exhibited. This conduit consists of a pipe moulded in sections from a peculiar material, "Dorsett Patent Asphaltum Concrete," a mixture, of which pitch and asphalt seem to form the chief elements, the pipe being solid in section, though it presents several parallel canals like the flues of a boiler through which the wires and cables are drawn. The material appears to possess properties of special excellence for the construction of underground pipes. It is strong and tough, requiring a pressure of from 119 to 398 pounds per square inch to crush it, when tested in small pieces. According to tests made by Mr. L. O. McPherson, electrician of the Mutual Union Telegraph Company, it possesses excellent insulating properties. Mr. McPherson states that he kept a piece of the material 8 inches square and 1½ inches thick, saturated on each side with acidulated water for three and a half hours and then placed it in electric connection with a battery of 330 callaud elements and a delicate galvanometer for a period of thirty minutes, and that its insulating properties under these conditions were perfect, there being not the smallest signs of leakage. Mr. W. R. Patterson, of the Western Electric Co., has also tested the insulating properties of this material. He took a section of conduit and immersed it in water, filling the holes with water and then measured the insulation between the holes and the water outside. The result obtained at the first test, showed an insulation resistance of 9,000 megohms for the length of 26 inches, used including a joint and a closed end. No change was apparent after soaking 36 hours. Mr. W. E. Athearn, electrician of the American Rapid Telegraph Co. has also made some tests of a section of this conduit, 32 inches long and 8 inches in diameter, containing 32 holes or canals, the outer row of which is one inch from the exterior or circumference.

The test was made for the sub-Committee on Mechanical Devices forming a part of the General Committee on Underground Communication. The test showed an insulation resistance equal to infinity with the apparatus used (Wheatstone bridge method.) The conduit was cut in two, so that its structure could be examined, and it was found perfectly homogeneous and uniform in structure. No tests have been made of its specific inductive capacity, though it is probably quite low. The asphaltum concrete conduit, which is manufactured under the Dorsett, Morris & Williams patents, is therefore worthy of consideration before those interested in underground systems.

DOMESTIC ELECTRICAL MANUFACTURING COMPANY.

The exhibit of this company was not very large, and as a matter of fact its relation to the art of telephony was rather difficult to perceive, but it was nevertheless interesting for two reasons: first, because the promoters of the company consist largely of telephone men, and second because their exhibit contained novelties of interest to all. The exhibit was incorporated with that of the Williams factory. Mr. A. P. Sawyer, the president of the company, was present and explained to the visitors the features of the devices exhibited, of which we noted three in particular. One was a gas-lighting device. In the handle of this gas lighter is a hollow space containing a couple of cells of chloride of silver battery hermetically sealed, and which are connected to an induction coil also contained in the handle. The two ends of the secondary wire of the induction coil pass through a hollow stem which can be of any desired length, according to the height of the gas jets to be lighted, and they end at two points placed within a short distance of each other. When a hair trigger placed in the handle is moved sidewise a vibrator is released which oscillates rapidly for a few seconds closing the primary circuit at each oscillation, and the induced current leaps between the points at the end in the form of a spark that lights the gas. The chloride of silver cells are the smallest, most compact and neatest imaginable. Externally they seem to be nothing more than a piece of vulcanite tubing, about 1½ inches in diameter and provided with a brass cap at each end. The elements and liquids are contained in this cell and the brass caps constitute the terminals of each cell; and to make the connections between the two or more cells used, it suffices to pile them inside the hollow handle, like rifle cartridges, so that their ends come into contact. The current, of course, causes the gradual reduction of the chloride to metalic silver, but the cells may be exchanged or renewed with very little trouble or expense. The other two novelties in this exhibit are both founded on the use of this battery. One is a pocket induction coil for physicians, which is certainly the smallest and neatest ever seen. The box is only 4 inches by 3, and 1 inch thick, and yet it contains the induction coil, two cells of chloride of silver battery and the electrodes which usually accompany such portable outfits. The last of the trio is an annunciator bell, for use in dwellings, etc., in which the box covering the bell magnet contains the couple of chloride of silver cells necessary to make the bell ring. The whole bell is not larger in size than the smallest type of the ordinary vibrator bell.

MISCELLANEOUS.

There were other manufacturers and dealers represented at the convention, but who did not send exhibits, presumably because their products are of that staple description which is sufficiently well known by electrical people. Among those we should menition Messrs. Patrick & Carter, of Philadelphia, dealers in electrical supplies, who were represented by one of their agents, Mr. E. W. Wilkins. Also Messrs. John A. Roebling's Sons, of New York, wire manufacturers, represented by Mr. H. L Shippy, and the Palmer Wire Company, of Palmer, Mass., represented by Mr. Hellyar. This company does a large business in the manufacture of wire for the use of the telephone companies and is just now erecting a new building to accommodate its rapidly increasing business, as recently mentioned in our columns.

REPORT OF THE PROCEEDINGS.

In addition to the valuable hints and suggestions that every wide-awake telephone man must gain by a visit to a telephone convention, these meetings are also pleasant social reunions. Those who have attended the other conventions—and there are many who have—felt when they looked around them at Cincinnati that they were among a party of old friends. It was almost impossible, of course, to get a complete list of the names of the telephone men present, as it was not easy in some cases to distinguish such from the other guests of the hotel. From New York, however, we noticed Messrs. W. H. Eckert, J. A. Seely, H. L. Storke, H. W. Pope, B. Cramer, A. M. Maconnell, J. Richie, G. H. Church, and J. S. Gaffney; also Mr. C. N. Fay, of Chicago, secretary of the association, and Col. S. G. Lynch and Mr. John Meek, of the same city as well as Messrs. Henry Bentley, J. Hutchinson, Dr. G. M. Plush and C. M. Root, from Philadelphia; Geo. T. Manson, H. B. Lytle, W. W. Lloyd, Thomas Sherwine and C. F. Cutler, Boston; Ex-Governor Henry Howard, Supt. J. W. Duxbury and H. G. Thresher, Providence; Morris F. Tyler, New Haven; W. D. Sargent, Brooklyn; S. W. Coles and H. B. Palmer, Buffalo; W. A. Jackson and L. Purtscher, Detroit; F. O. Vaiule and E. B. Field, Denver; H. D. Stanley and T. S. Reid, Bridgeport; Harry C. Haskins and Angus Hibbard, Milwaukee; C. F. Sise, Montreal; H. C. Baker, Hamilton, Canada; A. B. Uline and W. H. Cell, Albany; W. N. Estabrook, Elmira; Paul W. Bossart, E. V. Barth, and R. H. Arnott, Kansas City; C. W. Ross, Columbus; W. W. Smith and C. S. Smith, Indianapolis; W. C. Graves, Rochester; D. A. Baker, Jr., and W. G. Baker, Norwalk; Geo. G. Baker and G. F. Ford, Akron; J. H. Magruder, Jr., Port Clinton; S. M. Courtright, Allentown, Pa.; Henry Metzger, Pittsburgh; Henry L. Burton, Vicksburg; E. S. Babcock, Jr., Evansville, Ind.; Geo. C. Maynard, Washington; H. W. Spang, Reading; Wm. Ker, Harrisburg; A. P. Sawyer, Newburyport; R. M. Bailey, Williamsport; J. Chester Wilson, Altoona; F. E. Engle, Davenport; Edward White, Glasgow, Scotland; J. W. White, Fort Wayne, Ind.

The American Bell Telephone Company was represented by Messrs. Geo. L. Phillips, O. E. Madden, Thos. D. Lockwood, and Special Agents Frank B. Knight, C. R. Truax, T. B. Doolittle, R. S. Boyd and R. M. Brown.

The exhibitors were as follows:

Western Electric Company, Chicago, Mr. E. M. Burton, Colonel George L. Beetle, Messrs. John Young, C. E. Scribner, W. R. Patterson, Ernest Warner, Chicago; E. T. Gilliland, Indianapolis, Ind.

Charles Williams, Jr., Boston, represented by Messrs. F. W. Harrington and H. A. Cole.

Standard Electrical Works, Cincinnati, Messrs. E. V. Cherry, Isaac Kinzie, Charles Anderson, and H. A. Briggs.

Stabler Individual Bell Company, Washington, Mr. Jas. B. Stabler.

Law Telegraph Company, New York, Messrs. Wm. A. Childs and Frank Shaw.

American Electrical Works, Providence, Messrs. Eugene F. Phillips and Fred. H. Angell.

Rhode Island Telephone and Electric Company, Providence, Mr. J. F. Hedge, Jr.

Utica Fire Alarm Telegraph Co., Mr. Charles A. Rolfe.

Electrical Supply Company, Ansonia and New York, Messrs. Theo. Mack and J. H. Reid.

A. G. Day, New York, Mr. Day and Mr. Clarke B. Hotchkiss.

John A. Roebling's Sons' Co., Trenton, Mr. H. L. Shippy.

Partrick & Carter, Philadelphia, Mr. E. Ward Wilkins.

Palmer Wire Co., Palmer, Mass., W. H. Hellyar.

About 11 A. M. on the first day, the convention was called to order by the acting president of the association, Mr. J. B. Speed, of the Ohio Valley Telephone Company at Louisville. The secretary, after roll call, read his annual report. In dealing with the fact that there had been no increase of members, he said that this was due to consolidations. He recommended that the dues of the members should be assessed upon some regular basis, and suggested that the number of telephones in use by an exchange should be chosen for that purpose as equitable.

The secretary was allowed $300 as salary for the year just closed.

The report of Treasurer Beach showed total receipts amounting to $1,721.40; disbursements, $743.67, and cash on hand, $977.73.

The election of officers was next proceeded with and resulted as follows:

President, Mr. Morris F. Tyler.

Vice-President, Mr. Wm. H. Eckert.

Secretary, Mr. C. N. Fay.

Treasurer, Mr. F. G. Beach.

Executive Committee: President Morris F. Tyler, ex-officio, and Messrs. W. A. Jackson, of Detroit; H. L. Stroke, of New York; Colonel A. D. Bullock, of Cincinnati, and Henry Metzger, of Pittsburgh.

As a part of the advisory committee, to serve for three years, Mr. H. B. Lytle, was elected.

Ex-Governor Howard, of Rhode Island, extended an invitation to the association to meet at Providence, R. I., next year. The invitation was referred to a committee.

The secretary then read a special report from the executive committee in which reference was made in appropriate language to the death of the president of the association, Hon. Marshall Jewell, who died last February. Resolutions of regret for the loss sustained by that death were adopted by the executive committee at the time. These were confirmed by the convention and a eulogy on the late president was also pronounced by ex-Governor Howard, an old friend and acquaintance, and by Mr. Tyler.

After the new officers had been inducted into office, which was delayed until after the special report on the death of President Jewell, recess was taken until two o'clock.

AFTERNOON SESSION.

When the convention reassembled, after recess, President Tyler informed the delegates that the officers of the Cincinnati Exchange had extended to them a cordial invitation to inspect the workings of their exchange and would

also upon application be glad to furnish them with carriages and guides to the local points of interest.

It was decided to accept the resignations, as if tendered, of all members of the association that had been consolidated and had therefore no individual existence any longer.

Mr. Tyler, as chairman of the Committee on Legislation, read a report in which he said that the comparative absence of litigation affecting the exchanges was due to the care and closeness with which the American Bell Telephone Company had watched its interests. He further stated that in many of the States telephone companies were now in the enjoyment of the same rights as telegraph and railroad companies, and could condemn property for use upon payment of its fair valuation.

Mr. Sargent, chairman of the Committee on Statistics, furnished a striking array of figures, showing how large and universal the use of the telephone has become. The paper embraced reports from every part of the country. He grouped the cities into classes, the first class of cities with more than 250,000 inhabitants, including New York, Brooklyn, Boston, Philadelphia, Baltimore, Cincinnati, St. Louis and Chicago, and the paper showed the number of subscribers, the number of direct wires, the number of circuit wires, the number of trunk lines, the percentage of subscribers to population, the average number of calls per day, the number of operators and the proportion of operators to wires. It appears that the number of calls per day for each subscriber range from five to eight, Cincinnati averaging 11. There are in use now about one hundred and twenty thousand instruments, two in the smallest exchange, and 3,576 in the largest. Cincinnati has 2,099, and stands first among the cities of the first class, with a ratio of one instrument to every 122 persons of its population. The rate per year in Cincinnati is $100, as compared with $175 in some cities and $40 in others. Springfield, Mass., a lower city, shows the best ratio, which is one to fifty-four.

A general discussion followed, in which much interesting information was brought out. Electric bells, the different wires, and all the various electrical appliances of telephones were talked about, showing a variety of information and some diversity of opinion. The members were not backward in dissenting from an opinion when it did not coincide with their views. In consideration of the labor necessary to compile such information as was read by Mr. Sargent, the meeting appropriated $150 to be expended by the committee in clerk hire. There was no report from the Committee on Supplies and Appliances.

It was stated an experiment would be made on an extensive scale in the East with a new copper wire, about a gauge between twelve and fourteen. Attention was called to a new device for providing telephones with a key by which they can be locked to prevent use during the absence or without the consent of the subscriber.

Mr. Kerr, of Pennsylvania, nominated Mr. O. E. Madden for honorary membership, and he was elected.

Mr. Henry Metzger, of Pittsburgh, nominated Mr. Thomas D. Lockwood for honorary membership. He said: "Before closing the afternoon session, Mr. President, I would like to propose for honorary membership a gentleman who has from the outset labored with us arduously and ably, and whose constant association has, I am sure, benefited all of us. The gentleman's name is T. D. Lockwood."

The motion was put and adopted unanimously.

The convention then adjourned until 10 o'clock next morning.

SECOND DAY.

The convention met again on Wednesday at eleven A. M. After the reading of the minutes the first business in order was the designation of a day and place of meeting for next year. Governor Howard, who had previously invited the association to meet at Providence, among other potent arguments, mentioned that they had clams there in September. Without opposition Providence was selected as the place, and the first Tuesday after the first Monday of September named as the day.

The Committee on Subterranean Cables made a verbal report, followed by a paper by the secretary on cables used in telephone service in Chicago, San Francisco, London and Paris, which was taken up and discussed in short speeches by several members.

The committee on Exchange Rates was called, but had no report to make, and the convention adjourned for lunch.

At 3 P. M. the delegates reassembled, and went into executive session, and remained in private consultation and in the transaction of private business until after 5 o'clock. They reopened the public session only to formally adjourn "the Fourth Annual Convention."

The City and Suburban Telegraph Association, through President Bullock, Vice-President and General Manager Stone and Secretary Dickson, tendered the delegates a drive through the suburbs and a banquet at the Gibson at 4 P. M. Thursday. It had been the intention of the local committee to give an especially elaborate banquet, but it was abandoned as a bad precedent to set, as the association might meet in towns where the local committee could not afford the expense. Many of the delegates left on Wednesday night, however; but those who could do so remained and partook of the hospitalities thus provided.

The representatives of the Western Electric Company took as their guests to Milwaukee a number of the prominent delegates on Wednesday night. The special object of the visit was to inspect the new multiple switch-board in use in the Milwaukee Exchange.

THE TELEGRAPH.

POSTAL TELEGRAPH COMPANY.—This company will open its office on Water street, next door to the Colt House, in a few days, for local business. Through business is being done now. Meadville is an important office, and will be kept open until 1 A. M. every night.—*Crawford Journal, Meadville, Pa.*

THE BANKERS AND MERCHANTS.—News from Chicago of the 13th says: The Bankers' and Merchants' Telegraph Company filed articles of incorporation at the State Capital yesterday. It is stated that the company will endeavor to control the line along the Nickel Plate road, and thus secure an entrance into this city.

BEATS THE GUILLOTINE.—An invention has been offered to the United States Government for executing criminals without pain or unpleasant preparations. It consists merely of an armchair, isolated from the floor on which it stands, and having its arms connected with a dynamo-electric machine. The condemned person is seated in the chair, and then struck by lightning.

LIMITING SUNDAY SERVICE IN BERLIN.—An abridgment of office hours in the telegraph service on Sundays and Church holidays has been decreed in Berlin in as far as the requirements of the public and local circumstances permit. On such days telegrams will be received only from 12 to 1 P. M. At places where there are several telegraph offices some of them may, if circumstances permit, be closed altogether on such days.

ANOTHER CABLE COMPANY.—A certificate of incorporation of the Postal Telegraph & Cable Company was filed in the office of the County Clerk, Friday, Oct. 19. The company proposes to have a cable from Greenport, L. I., to England, to be connected with telegraphic lines throughout Europe, the United States, Canada and Mexico. The incorporators are Henry C. Gardner, Luther R. Marsh, F. H. Dupuy, Andrew W. Kent and Dumont Clark.

THE CANADIAN RAPID.—It is claimed, says the *Toronto Monetary Times*, that the charges for the transmission of messages, made by the Anglo-American Cable Co. in Prince Edward Island are excessive and that the promoters of the Canadian Rapid Telegraph Company are endeavoring to secure a half a million dollars of capital to start an opposition line. Cheap telegraphy is the basis of the new concern. The promoters are the Hon. Peter Mitchell, P. J. Brown, Ingersoll; John S. McLean, Halifax; Josiah Wood, M. P. Sackville, N. B.; John C. Harris, Moncton, N. B., and John Tugs, Senator J. S. Carvell, Samuel Prouse, M. P., P. E. Island.

THE W. U. REPORT.—The *Times* of last Sunday had the following in its financial remarks: The annual report of the Western Union Company for the year ending June 30, which was published on Tuesday, did not apparently do the stock any good. It was seen that the report was ingeniously contrived to give no information. The affairs of the company for the year are really dismissed in about six lines, making a bare, unsupported statement that its gross earnings, net earnings and expenses for the period were so much; but when one looks for the figures to prove this there is nothing. The report is blank. Pages are filled with irrevelant matter about what the company has been doing for 16 years, and a long list of so-called "marketable assets" in the company's treasury is set forth. There is no treasurer's report, or auditor's report, or balance sheet; nothing, in fact, by which any can know what the financial position of the company is, and the conclusion is irresistible that the compiler of the report intended it should not be known. But it makes little difference. There are people in Wall street outside the Gould circle who certainly do know how that company stands, despite the jealous care with which its books are guarded, and at the proper time the knowledge will be manifested. They know, for example, that the company is not earning the dividend it pays, any more than the Wabash earned the dividends it paid.

THE TELEPHONE.

THE RIGHT NAME FOR IT.—"Yes," said Amy, "I went to the telephone and put the thingumbob to my ear ——," "Thingumbob!" screamed the high-school girl; "you mean the audituent tube."—*Oil City Derrick.*

A WESTERN ABSCONDER.—It is reported from Lincoln, Neb., that A. F. Blundell, the manager of the Nebraska Telephone Co., has absconded with $1,400 of the company's funds. He is now supposed to be on his way to England,

THE GLOBE AND SHAW COMPANIES.—The long-pending negotiations between the Globe Telephone Co. of New York, and the Shaw Telephone Co. of Chicago, have finally been completed, and the Globe Co. now becomes the owner of the patents for the United States formerly owned by the Shaw Company.

TELEPHONE AND TELEGRAPH COMPANIES SUED.—Declarations were filed in Common Pleas Court, No. 2, Philadelphia on the 15th inst. by City Solicitor West in the city's suits against the Bell Telephone Company to recover license fees amounting to $2,095 on telephone wires, and against the Western Union and Mutual Union Telegraph Companies to recover $1,975 and $1.217 respectively as tax on wires and poles.

LONG DISTANCE TELEPHONING.—Telephone connection has now been made and completed between most of the towns in Northeastern Ohio. There is now perfect communication by telephone between Cleveland, Canton, Akron, Cuyahoga Falls, Ravenna, Solon, Sharon, Painesville, Wooster, Warren, Strasburg, Orrville, Niles, New Portage, Massillon, Madison, Louisville, Kent, Hudson, Geneva, Girard, Doylestown, Chagrin Falls and Ashtabula.

THE LONDON STREETS ROOFED IN.—The alarm at the increasing density of the network of telephone wires does not subside. Almost every day the dragging of a new wire across the old ones brings home the fact that the leading streets of London are being systematically roofed in. No less than 1,400 telegraph and telephone wires, it is said, stretch across Leadenhall street. Over Queen Victoria street they intersect each other at almost every foot. Already nervous persons avoid riding outside omnibuses.—*Pall Mall Gazette.*

PROFESSOR BELL'S PHILANTHROPY.—Professor Graham Bell has returned to Washington for the winter, and as a diversion from scientific research, and at the same time to relieve as much as possible the misfortune of his fellowmen, he has had an extensive addition made to his residence on Scott Circle, in which is a large school-room, adapted for imparting instructions after the new system, of the professor himself, to deaf mutes. Mrs. Bell will assist her husband in his unselfish task of imparting a knowledge of the new mode of communicating their thoughts, and thus be the means of some good to those unfortunate like herself.

TELEPHONIC AMENITIES IN TEXAS.—A Dennison, Texas, special of the 11th inst. says: "Mr. Burt Willis, superintendent of the telephone exchange at Sherman, had some words with A. W. Watson, superintendent of the exchange in this city, over the wire between the two places this morning, to settle which he came over, and as he was entering the central office met Watson, who drew a pistol and warned him not to enter. Willis insisted on going in, when Watson fired, the ball missing its aim. Willis beat a hasty retreat and saved himself from harm. Watson was not arrested."

NEW YORK AMBULANCE SERVICE.—The Police Commissioners of New York have charged Superintendent of Telegraph Crowley with the duty of ascertaining the best mode of connecting the elevated railroad stations with Police Headquarters as a means of extending the ambulance service to the elevated roads. Superintendent Crowley, on Oct. 19, recommended that the elevated railroad stations at Houston street and the Bowery and Bleecker street and South Fifth avenue be connected with Police Headquarters by telephones, so that ambulances could be speedily summoned to any station of the two roads in case of accident.

A COUNCILMAN SHOCKED.—The question of ordering the removal of some poles of the South Jersey Telephone Company was before the Street Committee of the Camden C Council on the 8th inst. Mr. Pfeiffer, chairman of the committee, announced that Mr. Janke had attempted to bribe him by inviting him to go out riding and offering him, with the compliments of the company, a telephone coupon book worth $15. "The committee was so shocked at this horrible depravity," says the *Press*, "that a motion to have the objectionable poles removed within five days by the Supervisor of Streets was carried almost unanimously." An adjourned meeting of Camden City Council was held a few days later. It was decided by a vote of 15 to 4 that the street committee be sustained in removing the telephone poles on Haddon avenue, which the South Jersey Telephone Company had erected without permission of Council.

"AIN'T YOU DEAF?"—A farmer stepped into Wells, Stone & Co.'s office recently and wanted to sell a load of apples. The buyer for the firm was at the telephone, and the financial man told the farmer to wait a moment, and as the buyer turned from the telephone, the man of cash, who was busy, attracted his attention by a nudge and pointed to the apples. He went out with the farmer and asked him what the apples were worth. The farmer dove into his pocket, pulled out a dollar, and pointed to the bushel-basket on the load. The buyer said: "That's too much, I'll give you 75 cents." The farmer shook his head and flourished the dollar. He was told that it was too much, and that he must take something less. He took out a scrap of paper and wrote 85 cents and $1, then by motions indicated that he would take 85 cents for one lot and $1 for the others. The buyer said: "All right; but why in —— don't you talk?" The farmer found his tongue and replied; "Why, ain't you deaf?" "Not that anybody knows of." "What did you have that tube to your ear for?" and the man from the rural districts learned about the telephone. —*Saginaw Courier.*

A MAGNETO-ELECTRIC CALL-BELL.—An ingenious call-bell, dispensing with batteries in telephony, has been invented, says *Engineering*, by M. Abdank-Abakanowicz. It is especially useful in long-distance telephoning where relays would have to be used for the call-bells, or else a very powerful battery. The transmitter consists of a U magnet between the branches of which is placed a bobbin having a soft iron core. This bobbin is carried by a spring fixed at its other end to a solid support or frame. The bobbin is withdrawn from its position of equilibrium between the poles by means of a handle attached to the

frame of the coil. Under the action of the spring, the bobbin oscillates between the poles, thereby setting up undulatory currents of electricity in the bobbin which is in circuit with the line. These currents last some seconds until the bobbin takes up its normal position of rest. After traversing the line they pass through a receiver consisting of a similar bobbin carried by a spring in a magnetic field. This bobbin is, however, fitted with a bell clapper, and when it oscillates with the magneto current it strikes the two gongs or bell plates.

Capital Represented at the Convention.—The Cincinnati *Commercial* of Thursday says: 'Those who remember the early trials and telephoning, only seven years ago, with its accompanying concerts and practical jokes, would be surprised to know how many of "the boys" of that period are now the heads of electric companies of various titles, with millions of dollars of capital, and to know how many are now rich and properous men. The late convention represented in its delegates over $100,000,000 of capital, a thing that seems like a story of Aladdin. The *Enquirer* of the same city and same date says: In conversation with one of the prominent delegates to the convention the reporter learned that the telephone interest of the United States is fast taking rank as the foremost of all monopolies. At present there is $600,000,000 worth of capital invested in it, of which over $200,000,000 was represented at this convention. It was noticed, too, that many of the delegates were not capitalists, but simply employés who have the brains to promote the interests of their employers. This convention has been adjudged a very profitable one, inasmuch as many things in the way of system, apparatus and appliances which are of vast importance to the Exchange have been discussed and passed upon.

THE ELECTRIC LIGHT.

Mexico.—The streets of Guanajuato are to be lighted with electricity. The Edison light is to be introduced into Jopilla de Juarez, Morelos, Mexico.

Reading, Pa.—The Reading Electric Light Co. has elected Thomas P. Merritt permanent President, and J. K. Righter Secretary and Treasurer.

The Nourse Mill, R. I.—A very important addition to the establishments at Woonsocket, R. I., is the above-named mill. It is lighted by 400 incandescent lamps.

The Hartford Opera-House.—The experiment of lighting the Hartford, Conn., opera-house with electricity works well, and the manager says it is the first theatre in the country to adopt the arc light.

Something Wrong.—The complaint is general in Reading that the city was better illuminated with gas than it is now with electric light, and that something is wrong in the management of the new company.

The National Horse Show.—Preparations for the above show are being pushed actively at the Madison Square Garden. A special feature of attraction will be the liberal use of the electric light outside and inside the building.

A Jablochkoff Improvement.—It is said that M. Tomassi has made an arrangement which makes the arc or the luminous point of the Jablochkoff light nearly stationary. As the "candle" burns down, a selenium regulator acts as an automatic elevator.

The Light of All the Russias.—The Russian Government has bought from the Swan Electric Light Company, for the price of $500,000, the exclusive right to use the inventions of that company in Russia, as well as the right to sell the lamps in that country.

The Armington & Sims in England.—The Armington & Sims Engine Company, Providence, R. I., are just shipping to the Edison Electric Light Company, Holborn Viaduct, London, England, another Armington & Sims engine for their electric light plant.

Cape Cod Canal.—The Cape Cod Canal Company will begin work next Monday evening, working by electric light, and has contracted with the American Electric and Illuminating Company to supply the necessary machinery and lamps of Thomson-Houston system for this purpose.

The Change at New Britain, Conn.—The goods to be manufactured by the Stanley Works, in their old factory just vacated by the Electric Company, at New Britain, are to be tacks of all kinds, shoe nails, etc., a new line of goods for that city. Electric lights will be used at night.

Plenty of Room for Extension.—In the factory insurance companies of New England, there are 856 establishments, whose valuation is nearly four hundred million dollars. Of these mills, 98, or 11½ per cent., use electric lights, the total number being 2,633 arc and 11,604 incandescent lamps.

M. F. Moore, for some time past the general manager of the Edison Company for isolated lighting, has resigned his position as general manager of that company, still retaining a directorship in the company, and becomes the general agent in New York city for the Armington & Sims Engine Company, Providence, R. I.

On Ship Board.—The introduction of electricity as a substitute for lamps and candles on board ship is making rapid progress. There is one source of safety in this to the ship and the passengers. All lights are put out at 11 o'clock. After this time people may talk in the dark, but there is no possibility of the reckless use of lights and lamps.

Depot Lighting.—The railroad commissioners of New York have ordered that the railroad station in Albany used by the New York Central, Boston & Albany, and the Belt Line trains be lighted by electricity. The depot is a dangerous one at night. Preparations are being made in obedience to the order, and will soon be completed.

Hartford and the Thomson-Houston.—Hartford, Conn., has a proposition from the local electric light company to furnish any number of Thomson-Houston lights required, wherever designated by the city, at 65 cents per night, to burn from sunset to daylight. The City Council considered the proposition Monday night, and referred it to the Street Commissioners.

In Illinois the Secretary of State licensed the following corporation on the 1st inst.: The Globe Electric Light and Power Co., Chicago, capital $600,000; incorporators, J. F. Rhodes, James L. Gage and Francis E. Morse. A certificate of change of capital stock from $10,000 to $20,000 was filed by the Forest City Electric Light and Power Company, of Rockford.

Plant for Pueblo.—The Phœnix Electrical Company of Canada (Craig system) announces that it has contracted to furnish the city of Pueblo, Mexico, a plant for lighting that city, consisting of four dynamos producing forty lights each, and a sixteen-light dynamo with 175 street lamps of 2,000 candle-power each, 100,000 carbons, 120,000 feet of cable and all the usual adjuncts.

The Boston "Boom."—The preferred stock of the American Electric and Illuminating Company continues strong on the market at $12.25 to $13 per share. It is stated on good authority that the directors are considering the payment of another extra quarterly dividend on the 1st of December. The company is now making preparations for the immediate construction of a new central station with a capacity for one thousand lights.

Semi-Annual Dividends Good Enough.—It is reported that some of the directors of the American Electric and Illuminating Company favor the payment by the company of an extra quarterly dividend on the first of December. The company's earnings are said to warrant it, but President Goff opposes it on account of the extra work it will cause in the office, and because he considers semi-annual dividends frequent enough.

Fuller Light in Lincoln Park, Chicago.—Mr. S. S. Badger, general agent at Chicago for the Fuller Electrical Company, has just put 25 Fuller lights on poles in Lincoln Park, one of the principal parks of that city. The poles are 35 feet high. At least 100 lights are needed to light the park properly, but even the 25 give a nice effect. It is said that this is the second park to be lighted by electricity in this country, Central Park in New York being the first.

Fighting for the Premium.—At Cincinnati, on the 8th inst., the U. S. Electric Lighting Company brought suit against the exposition commissioners for an injunction to restrain them from paying over the premiums awarded to the Edison Electric Light Company and the Thomson-Houston Electric Company. Judge Maxwell granted a temporary order. The plaintiff claims that the premium should have been awarded to it, because its light is superior to those of the defendants. It also wants $50,000 damages.

In the Dominion.—The Thomson-Houston Electric Light Company, which owns the Thomson-Houston patents for the Dominion, has a capital of $1,000,000, and its factory, which has been in operation since July, is turning out about two 12-light and one 20-light dynamo machines, with lamps complete, each week. The company has many lamps in operation in the streets and stores of Montreal, and local companies are forming in Quebec, Toronto, St. John, N. B., and other Canadian cities, to introduce the light.

Carbons for Electric Light.—Speaking of the new company to make carbons the Pittsburgh *Dispatch* says: "A new company is about to commence operations in this city for the manufacture of carbons for electrict lights. The company has a capital of $50,000, and intends to begin work just as soon as the stamps and machinery arrive, and they are expected every day. The carbons for electric lamps are made from petroleum coke, and the Standard Oil Company has a monopoly in furnishing this material. The coke for the new company will be furnished by the independent oil factory of D. P. Reighard & Co."

That Indianapolis Headlight.—The Wooley electric headlight for railroad locomotives was successfully tested on the Belt Railroad, Indianapolis, on the nights of the 10th and 11th. The light has a power of seven thousand candles, and casts a distinct illumination a distance of over one mile. No difficulty whatever was experienced from the jarring and jolting of the engine, the light continuing as steady when the engine was in rapid motion as when standing still. A strong company financially has been formed to put the light in practical use at once.

As Genial as the Sun.—At the reception and ball of the Albany Burgesses corps, to celebrate its semi-centennial anniverary, the armory hall was lighted with Edison incandescent lamps which, says the *Press* of that city, suffused the hall with a light as genial as that of an unclouded midday sun. The plants and flowers assumed deepened hues, and many of them being tropical, they looked as if springing from their native soil. The decorations, too, were rendered more beautiful by the aid of this light. The guests appeared entranced with these elegant surroundings.

Electric Lighting Regulations in Austria.—The Committee of the Electric Exhibition, taking advantage of the presence of many of the most prominent electricians at the present time in Vienna (says the Vienna correspondent of the *Standard*), has instituted a commission to draw up regulations to be imposed on electric companies as the condition of granting them concessions, on the model of those already existing in England. The result of the labors of this commission will be laid before an international committee, in which the Austrian Government will be represented.

Combined Gas and Electric Light.—The foreign journals report an arrangement for producing brilliant light by the combination of gas and electricity. It consists of an ordinary gas flame through which passes a curved metallic rod provided with means for counteracting the effects of overheating under the action of the electric current. A cool, bright, white light is produced of far better quality than of gas alone. The report states that the platinum does not require a great intensity of current to make it supply an ordinary light with one or two small elements. The cost is said to be a third less than that of the gas supplied by the gas companies.

Domestic Electric Light and Power Company.—Quinton Corwin and Charles B. Collier, of New York city, and J. Joseph Murphy, of Philadelphia, are incorporators and trustees of the Domestic Electric Light and Power Company, which filed a certificate with the Secretary of State at Albany, N. Y., on the 15th. The company has a capital of $1,200,000 divided into 60,000 shares, and proposes to manufacture, use and vend through the United States apparatus for the generation of electricity to be applied for lighting and the transmission of power, including such auxiliary apparatus as lamps, motors, etc. The principal office is in New York City.

An Unusual Accident.—One of the electric light wires belonging to the United States Illuminating Company, running under the elevated railroad structure near the station at Twenty-eighth-street and Third-avenue, was broken on the night of the 13th and fell across the telegraph wires below it. The friction destroyed the insulating material covering the electric wire, and when the naked wires came in contact, the telegraph wires were burned out and rendered useless. The wires destroyed belong to the Western Union and the Mutual District Messenger Company, cutting out the telegraph station of the Western Union on Third-avenue near Twenty-fifth-street.

Marks of Esteem.—Mr. H. M. Stevens, electrician and manager of the electric light company, says the Lowell *Courier* of the 13th inst., has been transferred to Worcester by the parent company. He is a good fellow, a hard worker, and made lots of friends while in Lowell. His associates and a few others last evening took the opportunity of presenting him a token of regard, consisting of a gold chain and charm valued at $70. Mr. Bayles, of the *Citizen*, did the honors appropriately, and Mr. Stevens responded as well as his surprise would let him. Treasurer Ross sent a special personal gift of $50, with a letter expressing his appreciation of the faithful services of Mr. Stevens.

Photographic Printing.—The last issue of the *Photographic News* brings the intelligence that the electric light has been harnessed to photographic printing on silver paper, in London. The negative used required twenty minutes when exposed in diffused daylight, using freshly prepared paper, and the color of the print was violet; a piece of paper exposed with the same negative under an arc lamp required thirty minutes to print, the color of the print being red. The lamp used is not the lamp that the inventor proposes to make use of in regular work, but the light is to be manufactured so that it will be steel blue in color. After the trial as above, an Edison incandescent lamp was placed over a piece of sensitized paper and a perfectly sharp image of the lamp showing plenty of detail was obtained in five minutes.

Fatal Contact with the Wire.—A dispatch from Dayton, O., of the 12th inst. says: Another instance of death resulting from contact with electric wire occurred at twelve o'clock last night in this city. The city is lighted by the Fuller system, which suspends the lamps at the intersection of the streets. While President Chandler, of the National Fuller Electric Light Company, President Lowe, of the Dayton Company, and Superintendent T. R. Robbins, also of the Dayton Company, were making a tour of inspection in the rain to-night, a lamp in the business centre of the city went out. Superintendent Robbins, in lowering the lamp, to examine it, took hold of the conducting wire where the insulation was worn off and fell as if shot. Before he died, which was three minutes later, he said "the life is burned out of me." Had the ground been dry or insulation more complete, he would have escaped.

The Jobbins Manufacturing Company.—The indications now are, says a western paper, that the Jobbins Manufacturing Company will commence operations at Aurora, Ill., with the earliest opening of spring. The delay

has been occasioned by the effort to have their electric light fully perfected before building operations were begun, and Mr. Jobbins, Sr., has been devoting his entire attention to the experiments in progress in New York, it being their intention to also manufacture the electric light plant in Aurora. In addition to water-wheels and electric light plant the company will build a variety of other machines secured by new and valuable patents, the sole property of the company. As will be remembered, they invested $15,000 in valuable property at Aurora, consisting of the old Stolp dam and land upon each side of the river. Next spring will see some of their shops erected, and, it is confidently predicted, concludes a local paper, that two years hence the Jobbins factory will be one of Aurora's most important manufacturing enterprises.

MISCELLANEOUS NOTES.

N. Y. ELECTRICAL SOCIETY.—The next regular meeting of this society has been postponed from October 19th to Friday, November 2d.

A TRANSFER.—The Rhode Island Telephone and Electric Company has taken the electric time service of the Time Telegraph Company for New England.

THE ELECTRIC MANUFACTURING AND MISCELLANEOUS STOCK EXCHANGE has rented a suite of rooms in the Duncan Building, at Nassau and Pine streets, and expects to begin business about Nov. 1.

DEATH OF AN ELECTRICIAN.—M. Albert S. Wetmore, electrician of the Euclid avenue Opera-House, Cleveland, died in that city last Tuesday of pneumonia. Mr. Wetmore had held the position named for the last five years, and besides the performance of his regular duties found time to make experiments, which resulted in the invention of several mechanical devices of practical value.

A NEW CORPORATION.—On the 15th inst. there was filed in the office of the County Clerk, this city, articles of incorporation of the Electrical Construction and Supply Company. The purpose of the company is to construct and maintain electric lighting, telegraph and telephone conductors and apparatus. The capital is to be $120,000, and the corporators are Frank E. Kinsman, Samuel T. Hillman and Richard H. Miller.

THE CABLE CONNECTING SWEDEN AND DENMARK.—The secretary of W. T. Henley's Telegraph Works Company, Mr. G. Sutton, under date of Oct. 7, writes: I beg to inform you that the four-cord cable manufactured by my company for the Danish and Swedish governments, and referred to in THE ELECTRICAL WORLD of the 22d ult. was successfully laid between Elsinore (Denmark) and Helsingbory (Sweden) a few days ago.

HE HAULED OFF HIS BOOTS.—Chorus of excited boys—"Then the lightning struck you?" Skipper, indifferently—"Oh, yes; I was leaning agin the mainmast when it struck it." Excited boys—"Didn't kill you?" Skipper, more indifferently—"Wal, no; it all ran down my back." Excited boys—"And what did you do, then?" Skipper, most indifferently—"I had to haul off my boots and pour the lightning out on the deck."—*Baltimore Day.*

"JACK OF ALL TRADES."—The English cable steamer Faraday is put to a variety of uses, beyond that for which she was built. When here in New York not long ago, she fitted up to receive live cattle, and took several hundred head across the Atlantic for British consumption. Now, on a return voyage from India, she has been employed to transport the wheat that is to offer competition to our own Western produce. Her cargo was 45,000 quarters, stowed in her three tanks, and accepted at the low freight of 4 cents per quarter.

CONVENTION OF INVENTORS.—A convention of American inventors will be held at Lyric Hall, Sixth avenue, near Forty-second street, on the 22d and 23d inst. The objects of the convention will be to establish a national association for securing to inventors their fullest rights, and protecting them against infringement; to establish a board of scientific and legal experts; to maintain a library of authoritative works; to resist the encroachment of organized efforts, which it is charged are now in progress, to weaken the legal protection afford to patentees by the government, and in good time to secure a national charter.

INFLUENCE OF HEAT ON THE PERMANENT MAGNETISM OF STEEL.—According to the *Chronique Industrielle*, some interesting experiments relating to the influence of heat on the permanent magnetism of steel were recently made by Prof. Poloni. He finds that the diminution of magnetic intensity by the increase of temperature in the steel bar has no rigid relation to the increase of electric resistance in the metal itself. While the permanent magnetism diminishes with increasing rapidity up to a temperature of 328° F., and then less rapidly up to 508°, becoming inappreciable at red heat, the electric conductivity of the iron diminishes uniformly with the increase of temperature.

EVAPORATION AND ELECTRICITY.—Dr. L. J. Blake has been investigating the statements of Pouillet and others to the effect that electricity is produced by the simple evaporation of a liquid. He worked with sea-water, sulphate of copper solution, chloride of sodium solution, etc., but in every case the results went to show that electricity is not produced in this way, and that some other means must be found of explaining the production of atmospheric electricity. Dr. Blake also negatives the hypothesis of Franklin and others to the effect that electricity is conveyed by still evaporation from an electrified liquid. The experiments were conducted with a quadrant electro-meter of M. Voss, Berlin.

THE CAEN ELECTRIC EXHIBITION.—The buildings of this interesting local exhibition in the old Normandy town, says an English exchange, are lighted by 261 Edison lamps fed by a K dynamo and a Z machine. M. Berjot exhibits his electric lamp in an improved form, and also a selection of Carré carbons, he being now associated with the house of Carré. The chief novelty of the exhibition is, however, an electric clock of M. Ledoux, in which a heavy vane added to the pendulum corrects by its mass the irregularities of the electro-magnetic action on the pendulum. There are also exhibited two electric dials, which repeat the hour given by a standard clock, and thus distribute the time much in the same way as the pneumatic clocks of Paris.

ELECTRICITY AND SURGERY.—In Vienna an interesting exhibition has just been made of some surgical instruments to which electricity has been applied. The cardiophone, for instance, is applied for auscultation of the heart, and the myophone for auscultation of the muscles. Nervous excitability is measured by the myographe. Another apparatus is employed to measure acuteness of hearing. These have been exhibited by Dr. Boudet, of Paris. An instrument which indicates the vibration of the larynx has also been brought to light by Dr. Brequet, of the same city. It is highly probable that all the resources of electricity have not been exhausted in the endeavor to secure it as the ally of medicine and surgery. That as much remains to be discovered in the sphere as has already been discovered is the expectation of all who confidently hope for an indefinite advancement in the powers which surgery and medicine at present possess.—*Evening Telegram.*

DISCARDING OLD THEORIES.—A practical electrician of Cleveland, who is too modest to let his name be known, says the Cleveland *Trade Review*, has a new theory of electricity which is indorsed by one of the leading electricians of the country, and which is briefly this: He discards the theories which would have it that electricity "travels" along a wire, or that there is a motion of the particles composing it, and boldly affirms that all substances are filled with electricity to a greater or less degree, so that the instant electrical energy is felt at one end, no matter how infinitesimal it be, it disturbs the equilibrium of the electrical contents of the entire body and causes a counter manifestation at the opposite end—just as water in a tube perfectly full is displaced at one end by the introduction of even a drop at the other. To any who may be inclined to deride this theory, we have simply to say that it comes from a gentleman who, besides having read everything within the range of modern electrical literature, has for years devoted himself successfully to the practical application of his valuable fund of knowledge on the subject.

AN ELECTRIC COUNTER.—M. J. Cauderay has devised, says *Engineering*, an electric counter or coulomb meter, which is exceedingly simple. It consists of a cylinder turning by clockwork at the rate of one turn per second. The cylinder is furnished with teeth like the barrel of a musical box, and arranged in circles at equal distances from each other. The middle circle, which divides the cylinder into equal parts, has no teeth. On each of the circles next it there is one tooth, on those next that again two teeth, on those next that again three teeth, and so on. The needle of a suitable ampère meter or ammeter is adjusted so that its zero position brings it tangential to the middle circle on the barrel. When, however, a current of ampère flows through the ammeter the needle is deflected to the first circle, and there the first tooth striking it works a counting apparatus. As the barrel rotates once per second, and the first circle has only one tooth, the counter records the number of coulombs. Similiarly when the current is two ampères strong the needle is tangential to the second circle, and is acted only by two teeth, thus giving the number of coulombs also.

FIRE AT THE METROPOLITAN HOTEL.—An employé of the Metropolitan Hotel, while going down the steps north of the main staircase to the lavatories in the basement on the night of the 15th, noticed that the back of the electric annunciator box, against the south wall of the office, was on fire. Mr. Henry Clair, the lessee, who was in the office, sent out an alarm at once, and saw that the standing hose on the first floor was manned. He also sent word of the fire to Messrs. Poole and Gilmore, in Niblo's Garden Theatre. The hose of the hotel had turned a stream of water on the fire in less than a minute. When the engines of the Fire Department drew up to their hydrants in Broadway in the neighborhood of the hotel they found that their services were not required. The fire was caused by the crossing of wires in the annunciator box, and the damage will not exceed $150. Messrs. Poole & Gilmore, on receipt of the alarm, took precautions to prevent a panic in the audience. The doors on the Broadway side of the house were closed to keep out the noise of the engines, while the nine exit doors on the Crosby side of the house were thrown open. Mr. Fred Williams, the stage manager, was notified of the situation, but the big audience remained in total ignorance of the occurrence.

STOCK QUOTATIONS.—Telegraph, telephone and electric light stocks were quoted on Thursday of last week and Friday of this week as follows:

	Oct. 11.	Oct. 19
American Cable	63	60
Western Union Telegraph	79	75⅝
Bankers and Merchants' Tel.	132¾	134¼
Commercial Telegram	111	100
Mutual Union Telegraph	17¾	....
American District Telegraph	26	16
American Bell Telephone	205	204
Shaw Telephone	30	30
Bay State Telephone	99½	101
Mexican Telephone Co.	2⅛	2
National Bell Telephone of Maine	70	71
New York and Pennsylvania	88	90
Boston & Northern Telephone	100	106
Overland Telephone	....	15
Suburban	100	100
Erie Telephone	50	50½
Granite State Telephone	....	85
New York and New Jersey	94	94
Daft Electric	....	112
Brush Electric Light	97	90
Edison Electric Illuminating	50	....
Edison Electric Light	...	75
U. S. Electric Lighting	120	120
American Electric Light	....	9
Electric Railway of United States	70	70

CABLE CABALS.—The London correspondent of the *Times* writing at the end of September, says: Following up the information I recently gave you as to the raising of money on this side for two new Atlantic cables, Alderman Hadley, in a city speech one day this week, referred mysteriously to a great enterprise, the preliminaries of which were being perfected in the city of London. I have reason to know that he was thinking of the scheme for extending and cheapening the cable communication between England and America. Although there appears to be some opposition to his candidature, the general opinion of the city favors Alderman Hadley's nomination for the chief magistracy. Should Alderman Hadley become Lord Mayor Hadley, I believe it is his intention to endow his year of office with an international history that shall eclipse the incident of "the flag" of a year or two ago. The Stars and Stripes were carried in procession with a guard of honor, as you will remember, in recognition of the memory of the martyred Garfield. Should Mr. Hadley reign at the Mansion House he will give a banquet to his American friends. He has received so much hospitable attention in America that he intends to demonstrate his gratitude in "a right royal way." It is not unlikely that he may invite the Mayor and Corporation of New York or the Mayors of the leading cities of the Union to dine with him at the Mansion House. In that case he will of course charter an ocean steamer for their especial use.

ELECTRICAL PATENTS ISSUED

And Dated Oct. 9, 1883.

We regret that, owing to a misunderstanding, the cuts intended to be used in this department this week were not ready in time. We shall endeavor to make up for the deficiency in future numbers.

Armature for dynamo-electric machines; Townsend Wolcott, New York, N. Y. 286,247
Armature for dynamo-electric machines; Geo. W. Fuller, Norwich, Conn. 286,415
Coupling shunt—dynamo-electric machines; Richard H. Mather, Windsor, Conn. 286,325
Combined call bell and fire alarm system; Charles E. Buell, New Haven, Conn. 286,529
Dynamo-electric machine; Silvanus F. Van Choate, New York, N. Y. 286,241
Dynamo-electric machine; Silvanus F. Van Choate, New York, N. Y. 286,242
Duplex Telegraphy; Patrick B Delany, New York, N. Y., assignor to the Standard Electric Manufacturing Company, same place. 286,279
Dynamo-electric machine; Geo. W. Fuller, Norwich, Conn. 286,414
Dynamo-electric machine; Geo. W. Fuller, Norwich, Conn. 286,416
Electric signal for railway trains; Edward R. E. Cowell, Detroit, Mich., assignor to himself, Lewis Mann, E. C. Brown, and Robert Miller, same place. 286,268
Electrical synchronous movement; Patrick B. Delany, New York, N. Y., assignor to the Standard Electric Manufacturing Company, same place. 286,273–4–5–6–7–8
Electrical synchronous mechanism; Patrick B. Delany, New York, N. Y., assignor to the Standard Electric Manufacturing Company, same place. 286,281
Electrical stand lamp; Jonathan H. Vail, New York, N. Y., assignor to Bergman & Co., same place. 286,350
Electric meter; Warren S. Johnson, Whitewater, assignor of one-half to William Plankinton, Milwaukee, Wis. 286,445
Electric gas-lighter; Theodore H. Parker, Boston, Mass., assignor of one-half to Charles E. and Frank Fuller, same place. 286,481
Insulating electric conductors; Herbert O. Phillips, Waterbury, Conn., assignor to Holmes, Booth & Haydens, same place. 286,220
Magneto-generator of electricity; James P. Stabler, Sandy Springs, Ind. 286,497
Process of forming electrodes for secondary batteries; Charles F. Brush, Cleveland, Ohio. 286,259
Process of making elements for thermal electric generators; Herman Frasch, Cleveland, Ohio. 286,288
Post for electric conductors; J. Allen Devlin, Philadelphia, Pa. 286,367
Secondary electric clock; Augustus S. Crane, Newark, N. J. 286,181
Support for electric wires and lamps; James & Hirley, Cincinnati, Ohio. 286,437
Telegraphic apparatus; Patrick B. Delany, New York, N. Y., assignor to the Standard Electric Manufacturing Company, same place. 286,280
Telegraphy; Patrick B. Delany, New York, N. Y., assignor to the Standard Electric Manufacturing Company, same place. 286,282

All Persons Sending for

Catalogues or ordering articles advertised in our columns will do us and our Advertisers both a great favor by mentioning that they saw the advertisement in

The Electrical World.

CAT-HEAD CARDS.—Lovely set, 4 designs. Mailed on receipt of 5c. HEARNE & CO., Box 1487. N. Y

Pride, Fraleigh & Kyle Telegraph Engineers Electricians and Contractors, 23 and 25 Dey Street, New York.

EVERYTHING

Relating to ELECTRICITY for sale, and Electrical work done. J. F. FAIRMAN, Cooper Union, N. Y.

THE "ELGIN" TELEPHONE,

for Private Lines. Copied by many, excelled by none! Address for illustrated circular ELGIN TELEPHONE Co., Elgin Kane County, Ill., U. S. A. L. G. Tillotson & Co., 5 & 7 Dey St., Agents for New York.

Telegraph and Electrical SUPPLIES

Medical Batteries, Inventors' Models, Experimental Work, and fine brass castings. Send for catalogue **C. E. JONES & BRO. Cincinnati, O.**

It is important to us that you mention this paper.

Bell Telephone Stocks

Bought and sold by J. O. SHIRAS, No. 11 West Third Street, Cincinnati, O.

MONEY LOANED ON TELEPHONE STOCKS.

CONSULTING CHEMIST AND ELECTRICIAN.—Analysis of all commercial and technical products. Investigations made on all questions bearing on electricity. Full information and prices mailed free on application. JAMES H. STEBBINS, JR., S. B., F. C. S., 117 Pearl St., New York.

SHORT-HAND

Writing thoroughly taught by mail. Terms low; satisfaction guaranteed. Send stamp for circular and specimen of writing.

W. W. HULTON, Stenographer, Pittsburgh, Pa.

ESTABLISHED 1859.

PLATINUM.

H. M. RAYNOR,

25 BOND STREET, New York.

NEW FOOT LATHES

For Electricians

Send stamp for circular to

Narragansett Machine Co.,

PROVIDENCE, R. I.

BOSTON AND SANDWICH

GLASS CO.

OFFICE AND SAMPLE ROOMS,

No. 17 MURRAY ST., N. Y.

REPRESENTED BY

C. E. L. BRINKERHOFF.

Short-Hand Writing thoroughly taught by mail. Good situations procured all pupils when thoroughly competent. First-class stenographers furnished railroad officials without charge for my services. Correspondence solicited. Caligraphs sold. Special inducements offered operators and railroad officers. Send for COLLEGE REPORTER and caligraph circulars to W. G. CHAFFEE, Oswego, N. Y.

Gelatinized Fibre.

(Trade Mark.)

The New Substitute for Hard Rubber.

Adopted by the leading Electric Light Companies and Manufacturers of Electrical Apparatus, being a better non-conductor, lighter and more durable, at half the cost.

Send for samples, circulars and prices to

COURTENAY & TRULL,

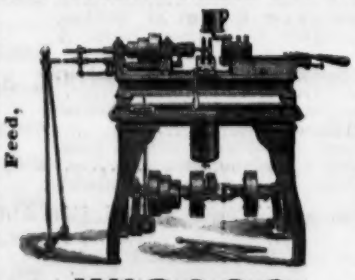
No. 15 Dey St., New York.

IMPROVED

SCREW MACHINES

OF EXTRA STRENGTH AND POWER, OF A SUPERIOR DESIGN AND FINISH.

With Automatic Wire Feed,

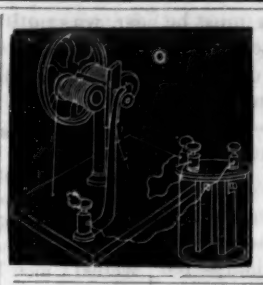


And a Perfect Screw (Jaw'd) Chuck.

WICACO

Screw and Machine Co.,

712 Cherry St., Philadelphia, Pa.



EDUCATIONAL ELECTRICAL

APPARATUS and SUPPLIES.

LATEST OUT.

"THE STUDENT'S ELECTRICAL CABINET"

with Elementary Guide of Instruction. Price, $15 complete.

Address for circular, **CURT W. MEYER**, 11 Dey St., New York.

PHOSPHOR-BRONZE TELEPHONE WIRE.

"Phosphor-Bronze."

The STRONGEST, TOUGHEST and BEST for line wires of electric and acoustic telephones. Will not STRETCH nor RUST. RESISTS SMOKE. ACIDS and DAMPNESS. TENACITY more than FOUR times its weight per mile.

PHOSPHOR-BRONZE RODS, SPRING METAL AND WIRE,

superior to German silver or brass for electrical apparatus. Already extensively used throughout the country. Address

THE PHOSPHOR-BRONZE SMELTING CO., LIMITED

512 ARCH ST., PHILADELPHIA, PA.

Owners of the U. S. Phosphor-Bronze Patents. Sole Manufacturers of Phosphor-Bronze in the United States.

The New York Electric Lines Co.

Manufacture and furnish **aerial Telegraph and Telephone Cables** absolutely free from troubles of induction.

These cables have the advantage that they may be laid underground at any time should legislation compel such a course. Estimates and cables of all sizes, lead inclosed or plain, for underground construction furnished for territory outside of New York.

Advanced scientific principles are applied in these manufactures.

Full explanations given on application.

OFFICES, 37 & 39 WALL STREET, NEW YORK.

EDSON'S SPEED AND PRESSURE RECORDING GAUGE AND ALARM.

Vibrating Gong and Batteries, to be placed in Engine Room.

EDSON'S STANDARD GAUGES

are alike adapted for steam, high and low pressure, water, oil and gas in reservoirs, pipes, etc., and are indispensable to safety and economy.

THE ALARM GONG,

by ringing at the boiler, prevents explosion and saves both life and property. The speed of DYNAMO MACHINES must be uniform, and these chart records are the best checks against irregular speed, placing responsibility where it belongs.

For descriptive illustration see No. 28 ELECTRICAL WORLD. For pamphlet and prices address

The Edson Recording and Alarm Gauge Co., No. 77 Liberty Street, N. Y.

GEORGE WESTINGHOUSE, Jr., President. ROBERT PITCAIRN, Treasurer.
C. H. JACKSON, Vice President and General Manager. ASAPH T. ROWAND, Secretary.
HENRY SNYDER, General Agent.

THE UNION SWITCH AND SIGNAL CO.,

PITTSBURGH, PENNA.,

A CONSOLIDATION OF

THE UNION ELECTRIC SIGNAL CO., AND OF THE INTERLOCKING SWITCH & SIGNAL CO.
Of Boston, Mass. Of Harrisburg, Pa.

SOLE OWNERS AND MANUFACTURERS OF THE ONLY PRACTICALLY SUCCESSFUL SYSTEM OF

OPERATING RAILROAD SIGNALS AUTOMATICALLY

ALSO OF

APPARATUS FOR OPERATING AND INTERLOCKING SWITCHES, SIGNALS AND GATES BY LEVERS, HYDRAULICS, PNEUMATICS OR ELECTRICITY.

ALSO MANUFACTURERS OF

FROGS, CROSSINGS, SWITCHES AND SWITCH STANDS.

☞ Plans, estimates and detailed descriptions, together with references to apparatus in practical operation, will be furnished upon application.

Office and Works, Corner Fayette Street, Garrison Alley and Duquesne Way.

THE TIME TELEGRAPH CO.

EXECUTIVE OFFICES, TEMPLE COURT,

NEW YORK.

TRUSTEES:

HON. HENRY HOWARD, Ex-Governor Rhode Island.
HON. ALEXANDER H. RICE, Ex-Governor Massachusetts.
HON. JOSEPH R. HAWLEY, U. S. Senator and Ex-Governor Connecticut.
JAMES HAMBLET, ESQ., Western Union Tel. Time Service.
SAMUEL ELLIOTT, ESQ., Journalist.
CHESTER H. POND, ESQ., Vice-President and Secretary the Gamewell Fire Alarm Telegraph Company.
JOHN H. SEED, ESQ., Wool Importer, 104 Reade street, New York.
FRANCIS C. SPOONER, ESQ., Retired Merchant.
BENJAMIN S. CLARK, Attorney and Counsellor.

OFFICERS:

CHESTER H. POND, ESQ., President. JOHN H. SEED, ESQ., Treasurer.
B. S. CLARK, ESQ., Secretary.

This Company now own and control forty-eight U. S. patents, covering every feature and branch of Electric Time Service. Is prepared to furnish isolated plants for Hotels, Public Buildings and Residences, or complete systems for cities or towns. Correspondence solicited.

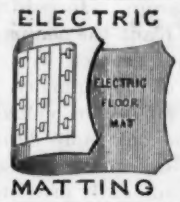
Any parties infringing any of the Company's patents are respectfully notified that they will be prosecuted to the full extent of the law.

ON TRIAL

French Battery for the cure of Rheumatism, Neuralgia and Nervousness. Send for circular.

C. E. JONES & BRO. Cincinnati, Ohio.

It is important to us that you mention this paper.



THE N. Y. APPLEGATE Electric Matting Co.

Invisible Electric Alarm Matting Appliances. Send for circular. Office, Mills Building, 35 Wall Street, New York.

JUST PUBLISHED.

Fully Illustrated. Price, $3.00.

PHILIP REIS:

Inventor of the Telephone.

A Biographical Sketch, with documentary testimony, translations of the original papers of the Inventor and contemporary publications. By SILVANUS P. THOMPSON.

Catalogue of Electrical Books free on application

E. & F. N. SPON,

35 MURRAY STREET, NEW YORK.

The Suffolk Electric Mfg. Co.,

28 SUDBURY ST., BOSTON,

MANUFACTURERS OF

Electric Bells, Striking Gongs, Annunciators, Burglar Alarms, Push Buttons, Switches, Keys, Spark Coils, Batteries, Electric Gas Lighting, and Specialties of all kinds.

READY SHORTLY.

ELECTRICITY, MAGNETISM AND ELECTRO-TELEGRAPHY.

A Practical Guide for Students, Operators and Inspectors, by

THOMAS D. LOCKWOOD,

With 158 Illustrations.

D. VAN NOSTRAND,

Publisher, 23 Murray and 27 Warren Sts., N. Y.

Complete Catalogue of Electrical Works will be sent to any address on application.

JOHN B. SABINE,

ATTORNEY AND COUNSELOR-AT-LAW, NOTARY PUBLIC

(ROOM 20),

102 Broadway, New York.

Companies incorporated at $20 to $100, ex. office fees.

Letters patent obtained at $20 to $65, ex. office fees.

Titles searched at 1 per cent. of the value of the property.

Collections made at 10 per cent.

Contracts, assignments, etc., drawn at $5 to $25.

Deeds, mortgages, etc, drawn at $3 to $30.

Wills drawn at $5 to $40.

Special terms for general assignments and compositions.

Special attention given to Patents for Electrical Inventions, and to litigation concerning the same. Correspondents in all parts of the country.

NEARLY READY.

ELECTRICITY

IN

THEORY AND PRACTICE,

OR

The Elements of Electrical Engineering.

A Clear Explanation of the scientific principles and the practical applications of Electricity.

BY

Lieut. BRADLEY A. FISKE, U. S. N.

8vo, Cloth, 180 Illustrations.

D. VAN NOSTRAND, Publisher,

23 Murray & 27 Warren Sts., New York.

Complete Catalogue of Electrical Books will be sent to any address on application.

CHARLES WILLIAMS, JR.,

109 to 115 Court St.,

BOSTON, - - - MASS.

MANUFACTURER OF

Telegraph, Telephone, and Electrical Instruments of all kinds.

MANUFACTURER OF

THE WELL-KNOWN

WILLIAMS CENTRAL OFFICE Telephone Switch-Board.

The best and most reliable as well as the most convenient system for Exchanges of any number of subscribers.

Switch-Boards of 25 or 50 lines in sets of any desired number for any capacity.

ALSO MANUFACTURER OF

MAGNETO BELLS

and subscribers' outfits of all kinds and descriptions, with Push Buttons or Magneto Generators having Automatic cut-outs, in various styles of finish, including Ebony, Birds-eye Maple, Cherry, Walnut, Ash, etc., with ornamentation to any desired extent, suitable for Cabinets, Parlors, etc.

EXTENSION BELLS

with Swiss, sleigh, cow-bells, or spherical ringers. Small, compact.

HAND AND POWER GENERATORS

capable of ringing bells through lines of 20,000 ohms resistance. For use in Central Offices or other purposes.

ALSO MANUFACTURER OF

EVERY DESCRIPTION OF TELEGRAPH INSTRUMENTS,

KEYS, RELAYS, SOUNDERS, ETC.

A complete line of House and Hotel Annunciators and Burglar Alarms, with all the latest improvements.

TELEPHONE, TELEGRAPH AND ELECTRIC LIGHT SUPPLIES,

LINE WIRE, INSULATED WIRE,

Batteries in Full Assortment,

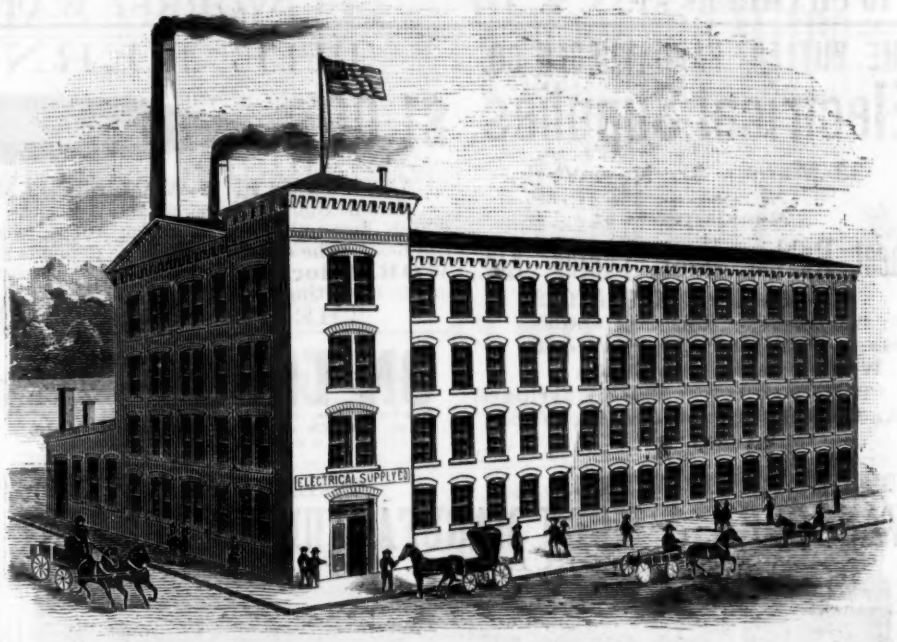
and everything else used by those engaged in Electrical Pursuits, of the best quality and at the lowest ruling prices.

Send for circulars and mention THE ELECTRICAL WORLD.

CHARLES WILLIAMS, JR.,

109 to 115 COURT STREET, BOSTON, MASS.

THE ELECTRICAL SUPPLY CO.



Factory of the Electrical Supply Company at Ansonia, Conn.

MANUFACTURERS OF AND DEALERS IN ALL KINDS OF

Telegraph, Telephone and Electrical Instrumants Apparatus and Supplies.

SOLE MANUFACTURERS OF THE

"DIAMOND" CARBON BATTERY.

This Battery, as perfected and improved, is Unequaled for Telephone or Bell Work.

It has more than Double the Carbon Surface

of any other Battery, and is unsurpassed for

Efficiency, Constancy and Simplicity.

Jar, 6 inches High, 4 inches Square. Fits any Telephone Box.

PATENTS ALLOWED, AUG. 1, 1883.

Least Internal Resistance.

Greatest Electromotive Force.

Greatest Power of Recuperation.

Cheapest Single Parts to Renew, Most Satisfactory and Substantial in Every Respect.

PRICE, COMPLETE, $1.25.

PRICE OF PARTS:

Jar only	each 15 cents.	Plain Zincs	10 cents.
Jar Top only	" 15 "	Zinc Connector	05 "
Carbon Ring (connector)	10 "	Mercury Cup	10 "
Each short Carbon	08 "	Sal ammoniac	08 "
Long Carbon and connector	30 "		

Discount—Per case, 10 per cent.; for 10 cases, 20 per cent; for 25 cases, 30 per cent.

Packed in cases of 1 dozen each, or in bulk. (Fifty Batteries complete.) Dozen cases will be charged 35c. each.

WE ALSO MANUFACTURE A FULL LINE OF

Insulated Wires and Cables for all Electrical Purposes.

Telegraph Keys, Sounders, Relays, Switches, Batteries, Etc.

HOUSE AND HOTEL ANNUNCIATORS AND BELLS.

SOLE AGENTS IN THE UNITED STATES FOR

Frederick Smith & Co.'s High Grade Galvanized Iron Telegraph and Telephone Wire.

FROM STOCK IN NEW YORK OR TO IMPORT.

Circulars and Price Lists mailed free. Correspondence solicited. Mention THE ELECTRICAL WORLD.

ELECTRICAL SUPPLY COMPANY,

No. 17 DEY STREET, NEW YORK.

HOLMES, BOOTH & HAYDENS,

MANUFACTURERS OF

FIREPROOF INSULATED ELECTRIC LIGHT WIRE

From Pure Lake Superior Copper. Conductivity Guaranteed.

Patent "K. K." Insulated Copper and Iron Wire, for Telephone and Telegraph Use.

49 CHAMBERS ST., N. Y. WORKS: WATERBURY, CONN. 18 FEDERAL ST., BOSTON.

THE BUTLER HARD RUBBER CO.

Electrical Supplies,

33 Mercer St., New York.

Manufacturers of

Sheet Rubber, Rods, Tubing, Etc.,

RUBBER HOOK INSULATORS.

Key Knobs, Switch Handles,
Magnet Covers, Magnet Heads,
Window Tubes, with Heads,
Battery Cells, Battery Syringes,
And Specialties of any Required Character.

THE KERNER STYLOGRAPHIC PEN.

$1.00. $1.00.

THE LATEST IMPROVEMENT IN STYLOGRAPHIC PENS.

The flexible air tube attached to the needle extension gives a soft and delicate touch to the pen and a vibratory motion which keeps the ink in a constant state of agitation while writing and causing a perfect flow to the point. Our $1.00 pen equal to the best. The difference in price depends alone upon the ornamentation. **Our No. 5 RULING PEN is the BEST IN THE WORLD for Book-keepers.** A perfect line always assured. No blurring or blotting. Price $1.50. Other styles according to mounting, $1.25, $1.50 and $3.00. Ask your stationer for them, or send to

THE KERNER STYLOGRAPHIC PEN COMPANY, 25 Bond Street, New York.

ON TRIAL French Battery for the cure of Rheumatism, Neuralgia and Nervousness. Send for circular.
C. E. JONES & BRO. Cincinnati, Ohio.
It is important to us that you mention this paper.

In Writing to Advertisers,
Always mention that you saw their advertisements in
THE ELECTRICAL WORLD.

For Men, Women and Children.

HOW TO GET STRONG AND HOW TO STAY SO

is a volume that should be in the hands of every body that places a proper value upon health, and the most practical way of obtaining and preserving it.

"The First Wealth is Health."—Emerson.

Simple Exercises for any given part or for the whole body, within the reach of all. No costly apparatus needed.

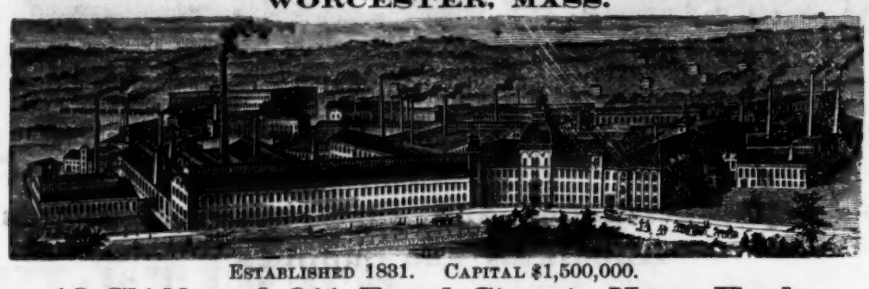
296 Pages, Illustrated, Cloth, $1.00.
Mailed postage paid, on receipt of price.

J. W. ENGLISH, Gen'l Agent,
515 Broadway, New York.

TELEGRAPH WIRE. TELEPHONE WIRE.

WASHBURN & MOEN MANUFACTURING COMPANY

WORCESTER, MASS.



Established 1831. Capital $1,500,000.

16 Cliff and 241 Pearl Street, New York.
215 Lake Street, Chicago.

This Company having given careful attention to Telegraph Wire from the introduction of the Art of Telegraphy, and especially with reference to the conditions necessary to *highest electric conductivity*, does not hesitate to recommend this class of its products as unequaled in that particular. Being the first to

MAKE A SPECIALTY OF TELEGRAPH WIRE

and anticipating at an early day the great demand that would exist for that article, they well adopted and fully proved certain methods and appliances for the production of Telegraph as have as of Telephone Wire which are peculiar to themselves. Among them may be mentioned the

PATENT CONTINUOUS ROLLING MILL, PATENT CONTINUOUS GALVANIZING BATH, AND THE BELGIAN ROLLING MILL.

(In connection with the Double Siemens Furnace).

All Wire made by this Company for Telegraph or Telephone purposes is thoroughly tested before shipping, with regard to Conductivity, Tensile and Torsion strength, as well as Elongation.

Prices and terms for Telegraph or Telephone Wire—Plain, Oiled or Galvanized—given upon application.

N. B.—The qualities known as extra Best (E. B. B.) and Best Best (B. B.) kept constantly in stock.

ELECTRICITY!

EVERY FAMILY SHOULD HAVE ONE OF

DR. JEROME KIDDER'S

Electro-Medical Apparatuses.

THEY ARE THE BEST, owing to the Simplicity of Operation, Durable Construction and Physiological Qualities of Electricity they produce.

DISEASES CONQUERED!
THE ENEMY ROUTED!

Why suffer from the effects of Rheumatism, Gout, Neuralgia, Paralysis, Dyspepsia and Nervous Diseases, when you can procure the only positive eradicator of diseases and promotor of health?

Our superior Electro-Medical Apparatuses *have stood the test, and are pronounced invaluable as remedial agents.*

The public should be on their guard against the many so-called Electric Belts, Bands, Armadillos, Brushes and Garments, as they are made to deceive the public, and not for their so called Electric Currents.

To distinguish the genuine from the spurious, send for a copy of the "Electro-Allotropic Physiology," mailed free. Address JEROME KIDDER MANUFACTURING CO., 820 Broadway, New York City.

United States Mutual ACCIDENT Association, 320 Broadway, N. Y.

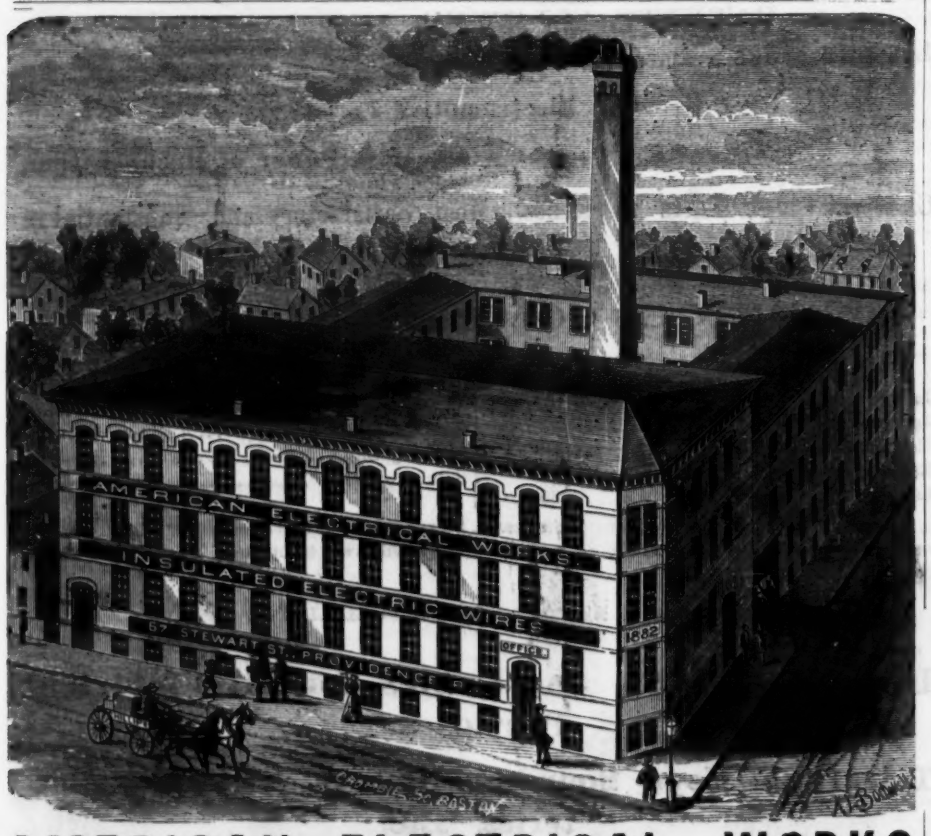
PLACE IT IN YOUR SAFE.

Invest $8 for $10,000 Accident Policy with $50 Weekly Indemnity in the

United States Mutual Accident Association,

320 and 322 Broadway, N. Y.

and place it in your safe. Twenty-five dollars a year will carry this insurance, and should misfortune overtake you in the way of fatal or disabling injury, there will never be cause to regret your forethought and prudence. European permits without extra charge.



AMERICAN ELECTRICAL WORKS

(Formerly EUGENE F. PHILLIPS),
MANUFACTURERS OF
PATENT FINISHED
INSULATED ELECTRIC WIRES,
TELEPHONE AND ELECTRIC CORDAGE,
ELECTRIC LIGHT WIRE.

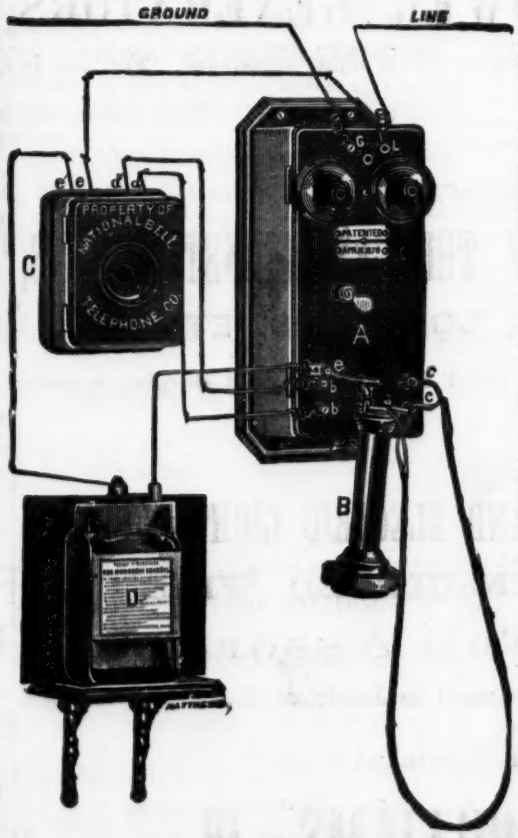
Magnet Wire, Patent Rubber-Covered Wire, Burglar Alarm and Annunciator Wire, Lead-Encased Wire; Anti-Induction Aerial and Underground Cables, etc., etc.

Office and Factory, 67 Stewart Street, Providence, R. I.

EUGENE F. PHILLIPS, President. W. H. SAWYER, Secretary and Electrician.

THE AMERICAN BELL TELEPHONE COMPANY.

W. H. FORBES, President. W. R. DRIVER, Treasurer. THEO. N. VAIL, General Manager.



This Company, owning the Original Patents of Alexander Graham Bell for the Electric Speaking Telephone, and other patents covering improvements upon the same, and controlling, except for certain limited territory, under an arrangement with the Western Union Telegraph Company, the Gold and Stock Telegraph Company, the American Speaking Telephone Company, and the Harmonic Telegraph Company, the patents owned by those companies, is now prepared to furnish, upon application, either directly or through any of its agents, Telephones of different styles, and applicable to a variety of uses.

This company desires to arrange with persons of responsibility for establishing

District or Exchange Systems,

in all unoccupied territory, similar to those now in operation in all the principal cities in this country.

Responsible and energetic persons are required to act as licensees for the purpose of establishing

PRIVATE LINE AND CLUB LINE

systems, for business or social uses. Also to introduce the telephone for

SPEAKING TUBE

purposes, for which instruments will be leased for a term of years at a nominal rental.

This Company will arrange for telephone lines between cities and towns where Exchange systems already exist, in order to afford facilities for personal communication between subscribers or customers of such systems.

We respectfully invite attention to this matter, and any further information relating thereto can be obtained from the Company,

No. 95 Milk Street, Boston, Mass.

All persons using Telephones not licensed by this Company are hereby respectfully notified that they are liable to prosecution, and for damages for infringement, and will be prosecuted accordingly to the full extent of the law.

VIADUCT Manufacturing Co.

OF

BALTIMORE CITY.

WORKS:
RELAY STATION, B. & O. R.R.

OFFICE:
CHAMBER OF COMMERCE,
ROOMS 29 AND 31.

This company, in connection with its present affairs, will continue the business of the late firm of

DAVIS & WATTS,

to which it has succeeded, the latter firm having dissolved, and Mr. Augustus G. Davis, its senior member, having assumed its entire assets and liabilities.

Mr. Davis has transferred to this company (of which he is president)

All Interests of Whatever Nature

Heretofore pertaining to Davis & Watts, and will henceforth give his personal supervision to the manufacture of electrical goods of every description.

Having increased facilities and ample capital, we will carry a large stock of

TELEPHONE, TELEGRAPH ELECTRIC LIGHT,

and American district supplies of all kinds.

Our works are on the Patapsco River, at the Relay Station, B. & O. R. R, with an abundance of water power.

We carry continually a large stock of

CROSS-ARMS,
PINS,
BRACKETS,
INSULATORS,
AND WIRE

(both line, office and electric light), and our prices will be found **most reasonable.**

We solicit a continuation of the favors heretofore extended by customers to the late firm of Davis & Watts, in the assurance that we can and will make it **to their advantage.**

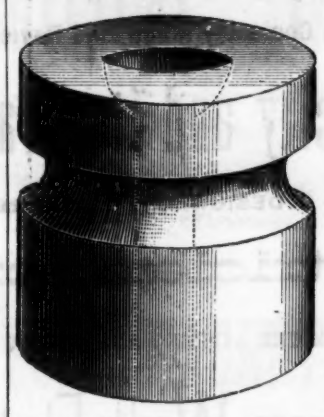
We have in preparation

A New Illustrated Catalogue

which, when ready, we shall be pleased to furnish.

VIADUCT MANUFACTURING CO.,
A. G. DAVIS, President.

Hard Porcelain Insulators,



LARGE AND SMALL,
FOR
Telegraph, Telephone
AND
Electric Work.

UNION PORCELAIN WORKS,
300 Eckford Street,
GREENPOINT, N. Y.

ON TRIAL French Battery for the cure of Rheumatism, Neuralgia and Nervousness. Send for circular.
C. E. JONES & BRO. Cincinnati, Ohio.
It is important to us that you mention this paper.

ALFRED F. MOORE,

MANUFACTURER OF

Insulated Wire

FOR

Telephone, Telegraph and Electric Light,

OFFICE, LINE,
AND
ANNUNCIATOR WIRE,
Magnet Wire and Flexible Cordage,

200 & 202 N. THIRD STREET,
PHILADELPHIA, PA.

DAY'S
KERITE INSULATED
Telegraph, Telephone and Electric Light

WIRES AND CABLES,

MANUFACTURED ONLY BY THE INVENTOR,

AUSTIN GOODYEAR DAY,
OFFICE: 120 BROADWAY, NEW YORK.
FACTORY: SEYMOUR, CONN.

KERITE INSULATION should be used on electrical conductors for any of the following purposes:

Submarine, Underground or Aerial Telegraph, Telephone and Electric Light Cables; Office Cables and Lines; also for Battery, Burglar Alarm, Fire Alarm, Police and Submarine Blasting Purposes,

or for any other operation which requires perfect, indestructible and permanent insulation of electric wires.

A large number of
ANTI-INDUCTION KERITE TELEPHONE CABLES,
some of them TWO MILES IN LENGTH, are in use in several cities, and are found to WORK PERFECTLY for that distance.

Kerite is recommended and indorsed by all leading men connected with telegraphy, telephony, and electric lighting.

At the CENTENNIAL EXHIBITION at Philadelphia, Sir WILLIAM THOMSON, the eminent Electrician and Scientist, awarded to the

Kerite Insulated Wire and Cables

A DIPLOMA

For "Excellence of the Insulation and Durability of the Insulator."

For Sale by all Dealers in Telegraphic Materials.

CLARK B. HOTCHKISS, Gen. Agt.
120 Broadway, New York.

CEDAR TELEGRAPH POLES.

LIGHT POLES FOR TELEPHONE LINES AND LONG POLES FOR CITY USE CONSTANTLY ON HAND.

50,000 Split Cedar Posts on Hand Ready for Immediate Delivery.

BROWNLEE & CO.,
Detroit, Mich.

TELEGRAPH AND TELEPHONE POLES.

65,000 25 to 60 feet. No. 1 Quality.

These Poles are Live Timber, well seasoned, and in every way desirable. Deliverable on line of F. & P. M., Mack. Div. M. C., P. O. & Pt. Austin Railroads.

Electric Light, Railroad, Telegraph and Telephone Companies supplied. Prompt delivery.

HENRY C. RIPLEY
EAST SAGINAW, MICH.

WHITE CEDAR TELEGRAPH and TELEPHONE POLES AND CROSS ARMS.

We are prepared to furnish White Cedar Poles and Pine and Spruce Cross Arms, all lengths and sizes, and in any quantity, delivered on cars or at any point in New England at short notice.

Contracts taken for the building and equipping of telegraph and telephone lines anywhere in New England.

Correspondence solicited.

BARNES & SNOW,
P. O. Box 493. BANGOR, ME.

PALMER WIRE CO.,

PALMER, MASS.

TELEGRAPH AND TELEPHONE WIRE,

As Good as the best. Special care taken in its manufacture.

Write us for prices before ordering elsewhere.

American Spiral Telephone Wire Company,

43 MILK STREET,
BOSTON, MASS., U. S. A.

NATHAN CLEAVES, President.
ALEXANDER R. BENTON, General Manager.
LYMAN B. JEWELL, Vice-President.
LEWIS C. BENTON, Secretary.
GORHAM GRAY, Treasurer.

Spiral Telephone and Telegraph Wire,

FOR

Long and Short Distance Telephoning.

UNLIMITED DISTANCE
FOR BOTH
TELEPHONE & TELEGRAPH SERVICE.

UNDERGROUND, AERIAL & SUBMARINE.

The agitation of each separate molecule comprising the central portion of the Spiral Wire is in a **direct** line with the length of the wire, the electrical current having an **unretarded straight** circulation through the central core from end to end, **protected** by four or more spirally arranged surfaces on the exterior of said wire, which convey continuous spiral currents, constantly throwing aside the adjacent inductive currents of other parallel wires, and also all atmospheric influences likely to retard the reproduction of articulation; hence **INSTANTANEOUS** reproduction of articulation from end to end of the spirally grooved wire over unlimited distances.

For telegraph use the Spiral Wire must be acknowledged as the only **perfect conductor,** breaking the circuit instantaneously and admitting of greatly increased rapidity of telegraphic communication.

The Spiral Wire is its own insulator. Its agitation is **instantaneous throughout.** The longer the Spiral Wire the less is it affected by any outside inductive influences, and absolutely uninterrupted pathway is insured throughout the core.

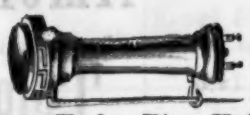
The weight of unlimited distance Telephone and Telegraph Wire is but 110 lbs. per mile.

Orders will meet prompt attention.

The patents for this electrical conductor were granted only after long practical tests at Washington, and its superiority acknowledged by the best electrical authority, who had heretofore pronounced it a fallacy.

American Spiral Telephone Wire Co.,
43 MILK STREET,
BOSTON, MASS., U. S. A.

Telephone Jewelry!!



Telephone Badge Pin.—Full Size.

SCARF PINS and BADGE PINS

—)IN THE FORM OF(—

MINIATURE TELEPHONES,

One Inch in Length, Neat and Handsome in Appearance, and Complete in every particular. The Telephone is an Exact Representation of the well-known hand Bell Telephone in use all over the country.

A Unique and Appropriate Ornament for those Connected with the Telephone Business.

This jewelry is of the best and most careful workmanship, and, aside from its distinctive merits as emblematical of the telephone profession, it has the additional one of being neat and handsome in itself.

Every Telephone Man should have one!

PRICE LIST.

	Rolled Gold.	Solid Gold.
Telephone Scarf Pin	**$2.00**	**$5.00**
Telephone Badge Pin		**5.00**

Mailed, POSTAGE PREPAID, to any address in the United States or Canada on receipt of the price.

☞ A Rolled Gold badge or scarf telephone pin will be mailed, postage prepaid, to any one sending us a club of **5** yearly subscriptions to The Electrical World at $2.00 each; or a Solid Gold one for **10** yearly subscriptions. Remit by postal note, post-office order, draft, registered letter or express. Address,

W. J. JOHNSTON,
NO. 9 MURRAY STREET, New York City.

The Electrical World

—) HAS PUBLISHED (—

MORE AND BETTER ARTICLES ON TELEPHONY

THAN ANY JOURNAL IN THE WORLD.

It Has Regular

SPECIAL ARTICLES ON TELEPHONY,

—and also a—

Telephone Department,

—) in which appears each week an epitome of (—

WHAT IS GOING ON IN THE TELEPHONE WORLD.

Notwithstanding this, however,

THE PUBLISHER

requests those connected with

THE TELEPHONE BUSINESS

TO CO-OPERATE WITH HIM

in making the paper **even more interesting and valuable than heretofore to TELEPHONE MEN.**

With this end in view, he solicits **correspondence, items** and **opinions** from **all classes of telephone men everywhere.**

It will interest **other** telephone managers, superintendents, and the like to know what **you** are doing; and the notes you furnish may call forth others which will give **you** hints and suggestions of great value in your business.

We are always **glad to hear from telephone men** and to publish such items of general interest as they send, and will feel grateful for any assistance rendered in this direction.

The paper aims to furnish telephone men a means of **exchanging views** and opinions on telephonic subjects, and all are welcome to take full advantage of the privilege.

THE ELECTRICAL WORLD

A Copiously Illustrated Review of Current Progress in

Electricity and its Practical Applications,

DESIGNED TO INTEREST AND BENEFIT

Electricians of all Classes,

FROM THE ASPIRING AMATEUR TO THE ELECTRICAL ENGINEER.

The Pioneer Weekly Electrical Journal of America.

Promptest and most complete record of the latest improvements and developments in

TELEGRAPHY.

The best and fullest summary of information and general news relating to

TELEPHONY.

The most faithful exponent of progress in

ELECTRIC LIGHTING,

AND OF THE ADVANCE IN

ALL THE OTHER BRANCHES OF ELECTRICAL INDUSTRY.

IN SHORT, A COMPLETE CURRENT HISTORY OF

ELECTRICITY IN ALL ITS APPLICATIONS.

"'Tis not in mortals to command success;
But we'll do more, Semphronius; we'll deserve it."

WHEN

THE ELECTRICAL WORLD

was founded, it was determined to make the paper, as far as was practicable and judicious,

Original and also Strictly American,

A Course which has been conscientiously carried out.

This involved Considerable Extra Labor and Expense, but it gives

THE ELECTRICAL WORLD

A Practical Value to American Electricians,

that a paper which merely reprints articles from foreign journals can never attain.

The Subscription was placed at an Exceedingly Low Rate for such a Paper.

Only about one half what is charged for American Journals of similar character in other branches of industry, and less than half the price of corresponding Foreign Electrical Papers.

READ THIS COMPARISON OF PRICES.

	PER ANNUM, POSTAGE PREPAID.
"ELECTRICAL WORLD" Weekly, to Subscribers in the U. S. & Canada	**$2.00**
London "Electrician," Weekly, to Subscribers in England	4 87
London "Electrical Review," Weekly, to Subscribers in England	4 87
Paris "La Lumiere Electrique," Weekly, to Subscribers in France	10 00

THE AIM, AS WILL BE SEEN, IS TO MAKE

THE ELECTRICAL WORLD

Highest in Excellence yet Lowest in Price.

THE EDITORS AND CONTRIBUTORS ARE THE BEST AND MOST COMPETENT

ELECTRICAL EXPERTS AND WRITERS TO BE HAD,

who can and do explain technical matters in simple, clear, concise language, so that while the most advanced electricians get new ideas and valuable hints and suggestions, the younger members of the profession, ambitious amateurs and those not familiar with the higher branches of Electrical Science can readily appreciate and follow the subject.

SUBSCRIPTION, ONE YEAR, $2.00; SIX MONTHS, $1.00.

ON TRIAL THREE MONTHS, 50 CENTS.

SAMPLE COPIES MAILED FREE.

W. J. JOHNSTON, Publisher, No. 9 Murray Street, New York.

Standard Electrical Works,

Authorized Agents and Manufacturers of The American Bell Telephone Company's Bells, Switch-Boards, etc.

SOLE MANUFACTURERS OF

THE CELEBRATED POST MAGNETO BELL,

WHICH WE CLAIM TO BE

THE FINEST BELL IN THE WORLD.

MANUFACTURERS OF AND DEALERS IN

TELEGRAPH, TELEPHONE AND ELECTRIC LIGHT WIRE AND SUPPLIES.

AGENTS FOR

Roebling's Galvanized Line Wire.

REASONS WHY OUR BELLS ARE THE BEST:

FIRST,

Because we make the cylinder of our generator, containing the magnets, of **solid brass and iron cast together** (our patent way). By this we are enabled to get the cylinder perfectly true, and are able to set the magnets out very close to the metal, thereby **increasing the strength** and **decreasing friction,** and preventing dust or dirt from getting in.

SECOND,

Our **New Cut Wheel Gear,** nearly noiseless, will give better satisfaction than any way heretofore tried. The **friction** slips; the **plain rubber** band wears away: we make the gear of small teeth, both cut the **same way;** that largely does away with the noise; very positive in its action, and we provide for any wear by adjustment.

THIRD.

We have **less soldered connections** to get loose or out of order than any other bell made. The bell is so arranged that it can be opened, exposing all connections, without cutting out the bell—very important for quick and thorough inspection. All the vital connections have **rubbing contacts** and are **set upright,** thereby preventing dirt from remaining on them.

OUR IMPROVED SWITCH-BOARD

HAS NO SUPERIOR ANYWHERE.

We use no Cords, depending entirely upon Rubbing Contacts.

WE ALSO MANUFACTURE

LIGHTNING ARRESTERS, POWER GENERATORS, COMBINATION BELLS,

And all the et ceteras needed by a Telephone Exchange.

OUR EXTRA TERRITORIAL BELL

IS GUARANTEED TO RING THROUGH

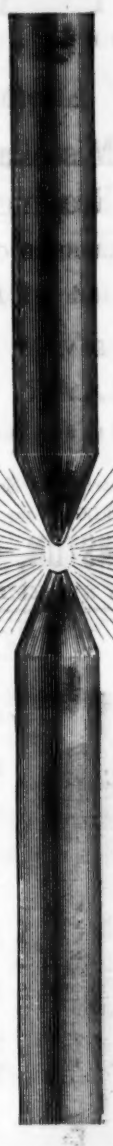
20,000 OHMS RESISTANCE.

Send for Catalogue and Price-List and Mention "The Electrical World."

STANDARD ELECTRICAL WORKS,

CINCINNATI, OHIO.

Boulton Carbons.



These carbons are made of the best materials, and with the latest improved machinery, of any required degree of hardness, and can be used in all makes of Electric Lamps. The regular sizes, 12 inches long, run from ¼ inch to 1 inch in diameter, varying by sixteenths. Special lengths and sizes to order. A large and complete stock always on hand.

The want of a high order of battery plate has long been felt. Those wishing such would do well to use the **Boulton Plates.** Special attention is given to the manufacture of all sizes to order. Price-Lists and full information furnished on application.

BOULTON CARBON WORKS,

990 Payne Avenue, Cleveland, O.

Stabler Individual Call.

SOME OF ITS ADVANTAGES.

1st. It calls any subscriber on a circuit line without sounding the bells of the others.

2d. It gives each subscriber, while using the line, entire privacy and freedom from interruption.

3d. It shows every subscriber at a glance, by the position of the index, whether or not the line is in use.

4th. It is very simple in construction, easy of manipulation and rapid and reliable in action, the instruments being *automatically* maintained in unison.

5th. It is operated without clock-work—by impulses direct from the generator at the Exchange, and is under exclusive control of the operator.

6th. It relieves the subscriber of any duty but to answer his calls, and renders it impossible for him to interfere with others through ignorance or neglect.

7th. It is exclusively a magneto call, requiring no battery, and combines, in a very handsome box but little larger than the ordinary magneto bell, the individualizing apparatus, local generator for calling Exchange, bell and telephone switch.

8th. It works equally well over long or short lines (from short circuit to 2,000 ohms), and no change of adjustment in the bells is required when additional ones are looped into a circuit already established.

9th. One Central Office instrument and generator can be used on any number of circuits by switching from one to another.

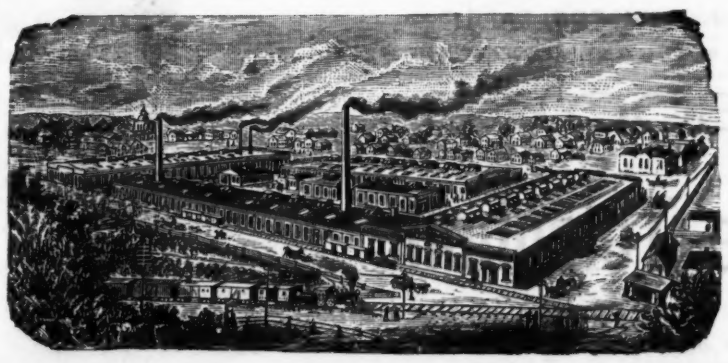
A practical test of this call was made on one of the busiest lines of the Washington, D. C., Exchange, which lasted continuously from December, 1882, to June, 1883, giving entire satisfaction to both the subscribers and Telephone Co., and developing the entire reliability of the system under all atmospheric conditions.

Sets of the apparatus furnished for trial on application to

THE STABLER SIGNAL CO.,

P. O. Box 388, WASHINGTON, D. C.

ARC LIGHTS.



WE DESIRE TO CALL ATTENTION TO THE

BRUSH MACHINES

We are now manufacturing, intended to give lights of about two-thirds of the power of our usual size of arc lights. They are fully equal to the ordinary size lights of other systems, and except in the amount of light are the same in every respect as our other lights.

Number of Machine.	Number of Arc Lights.	Nominal Candle Power.	Horse-Power required.
5	10	1,200	6
6	20	1,200	11
7	30	1,200	15
8	64	1,200	35

Prices of our machines and lamps the same as our regular list. Our agents will give estimates We shall commence this month the shipment of

BRUSH STORAGE BATTERIES

To fill the large orders which have accumulated on our books. We desire to state that these batteries are

GUARANTEED

By this Company, just as all the apparatus hitherto sold by us has been; and that the statements of our opponents regarding them, which have been so industriously circulated of late, are false in every particular.

THE BRUSH ELECTRIC CO.,

No. 379 Euclid Avenue,

CLEVELAND · · OHIO.

MAY 12, 1883.

Telegraph and Electrical SUPPLIES
Medical Batteries, Inventors' Models, Experimental Work, and fine brass castings. Send for catalogue **C. E. JONES & BRO. Cincinnati, O.**
It is important to us that you mention this paper.

HOSPITALIER.

SECOND EDITION NOW READY.

THE MODERN APPLICATIONS OF

ELECTRICITY.

(2 VOLS)

BY

E. HOSPITALIER.

Sent Post-Paid on Receipt of Price, $8.00

ADDRESS

W. J. JOHNSTON, Publisher,
No. 9 Murray St., N. Y.

THE

ELECTRICAL WORLD,

TERMS OF SUBSCRIPTION,

Invariably in advance:

One Copy, 1 year, Postage Prepaid, $2.00.

Six Months, $1.00;

Three Months, 50c.

No one who desires to keep abreast of the wonderful activity in Electrical Discovery and Invention that characterizes our time should be without it.

The Postage to any part of the United States or the Dominion of Canada is always prepaid by the publisher, and addresses are changed as often as desired, without extra expense.

To foreign countries in the Universal Postal Union—which includes Newfoundland, England, France, Germany, Australia, etc.—the subscription price, postage prepaid, is $3.00 per annum.

Remit by post office order, draft, registered letter or express. U. S. postage stamps taken. Address communications and make orders payable to

W. J. JOHNSTON, Publisher,
No. 9 MURRAY ST., NEW YORK.

BOOKS

ON

The Telephone

Inventor of the Telephone. Philip Reis, inventor of the Telephone. A biographical sketch, with documentary testimony, translations of the original papers of the inventor, and contemporary publications. By Prof. SILVANUS P. THOMPSON. Cloth. Illustrated by three plates and forty-eight engravings..$3.00

Practical Information for Telephonists. By T. D. LOCKWOOD, Electrician, American Bell Telephone Company. 12mo, cloth..... 1.00

The Telephone. A Lecture by Prof. ALEXANDER GRAHAM BELL, Delivered before the Society of Telegraph Engineers. 8vo, paper, 30 illustrations.... 60

The Telephone, the Microphone, and the Phonograph. By COUNT DU MONCEL. Authorized Translation, with Additions and Corrections by the Author. 12mo, cloth, 70 illustrations..... 1.25

The Speaking Telephone, Electric Light, and other Recent Electrical Inventions. By GEORGE B. PRESCOTT. 8vo, cloth, 319 illustrations and 1 plate..... 4.00

The Telephone. An Account of the Phenomena of Electricity, Magnetism and Sound, as Involved in its Action; with Directions for Making a Speaking Telephone. By A. E. DOLBEAR. Second Edition. 18mo, cloth, 17 illustrations.... 50

W. J. JOHNSTON, PUBLISHER,
No. 9 Murray Street, New York.

THE OPERATOR

A JOURNAL OF

Telegraphic Literature, News and Miscellaneous Reading.

PUBLISHED ON

THE 1st AND 15th OF EACH MONTH.

SUBSCRIPTION, IN ADVANCE,

ONE DOLLAR A YEAR.

Postage Prepaid to any part of the United States or Canada.

To Foreign Countries the Subscription, POSTAGE PREPAID, is $1.50 a Year.

W. J. JOHNSTON, Publisher,
NO. 9 MURRAY STREET, NEW YORK

PLATINUM.

JOHN H. MUEGGE,

MANUFACTURER OF ALL KINDS OF

Crucibles and Vessels. Plate, Wire, Foil and Sponge.

Scraps purchased.
No. 91 Liberty Street, New York.

ENGLISH
Patent Office.

H. GARDNER,
166 Fleet St., London.

Successor to

Messrs. Robertson, Brooman & Co.

Gives prompt personal attention, and obtains Patents for Inventions, Protection for Trade Marks, etc., at fixed and moderate charges. Pamphlet of costs gratis.

Thirty years' practical experience.

Provisional Protection, £8

Telegraph and Electrical SUPPLIES
Medical Batteries, Inventors' Models, Experimental Work, and fine brass castings. Send for catalogue **C. E. JONES & BRO. Cincinnati, O.**
It is important to us that you mention this paper.

J. H. LONGSTREET,

No. 9 Barclay Street,

NEW YORK,

MANUFACTURER AND DEALER IN

TELEGRAPH INSTRUMENTS,

Telephone and Telegraph Supplies OF EVERY DESCRIPTION, ANNUNCIATORS AND BURGLAR ALARM APPARATUS, BATTERIES AND BATTERY MATERIAL.

Telegraph Instruments for Railroad Use a Specialty.

THE BERGMANN & HAID BATTERY.

THE GREATEST OPEN-CIRCUIT BATTERY IN THE WORLD!

BERGMANN & CO.

Height, 6½ inches.
Diameter, 3¼ inches.

Have now succeeded in supplying what has till now been the GREAT DESIDERATUM in Telephone and all open circuit work. This Battery is not only

The Simplest, Cleanest, Most Economical and Most Durable of All,

but it overcomes all the existing defects of the Leclanché and other forms hitherto employed.

It is Small, Neat, Compact and very Portable, Hermetically Sealed, and Guaranteed to form no Gases. On this account it requires hardly any attention.

IT WILL LAST MORE THAN TWICE AS LONG as any other. IT IS CHEAPER than any other.

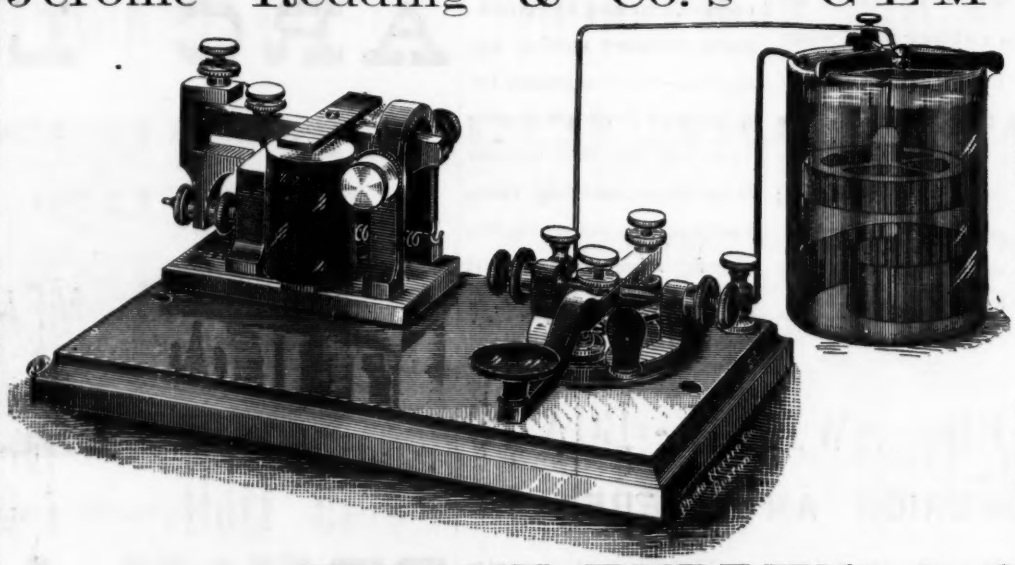
PRICE CHANGED TO $1.20, COMPLETE.

Samples sent to dealers and telephone exchanges on application. Send for circular. Liberal Discounts to dealers.

BERGMANN & CO.,
ELECTRICAL WORKS,
292 to 298 Avenue B. corner Seventeenth Street, New York.

Jerome Redding & Co.'s "GEM" Instrument

$3.75.



Including the above large-sized Sounder and Key, a large Cell of Callaud Battery, one roll of Office Wire, Chemicals, etc.

The only low-priced Instrument of this class that has nicely finished **BRASS** *Sounder and Key Lever, with perfect adjustments for both.*

Price for Complete Outfit as above	$3.75
Price for Instrument alone	3.00
Price for the whole outfit (except Glass Jar), with Key and Sounder separate, by mail, post-paid	4.32
Price for Instrument alone, by mail, post-paid	3.60
Price for Instrument alone, for lines 1 to 15 miles	3.60
Price for Instrument alone, for lines 1 to 15 miles, by mail, post-paid	4.05

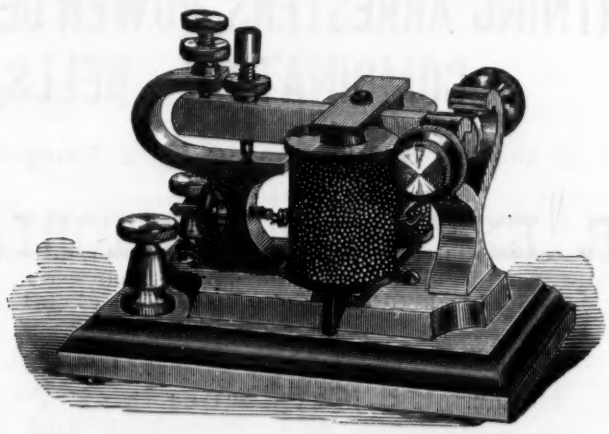
SEND FOR CIRCULAR.

JEROME REDDING & CO.,
MANUFACTURERS OF TELEGRAPH AND ELECTRICAL SUPPLIES,
NO. 30 HANOVER STREET, BOSTON, MASS.

LYMAN'S O. K. INSTRUMENTS.

No. 2 O. K. KEY.

The above Key is a perfect working key, and has *pure platinum points.* Finished Brass Lever and Rubber Knobs. Price, $1.45, C. O. D., subject to inspection.



No. 2 O. K. SOUNDER.

The above Sounder is warranted to work well where any sounder will. Price, $2.60, C. O. D., with privilege to examine before paying for it.

These are no Toy Instruments. We guarantee them to work well where any Key or Sounder will work. Both Key and Sounder lever are brass and nicely finished.

The above Sounder and Key (either on one base or separate, as ordered), one full-sized Callaud battery, 1 lb. vitriol, 15 ft. office wire, etc., all nicely packed and sent C. O. D., **$4.50,** with privilege to examine before paying for them.

If you want cheaper instruments, send 3 cent stamp, for our reduced price-list. Will fill all orders the same day we receive them. Address, mentioning this paper,

A. B. LYMAN & CO., 36 South Water Street, Cl d O.

WESTERN ELECTRIC COMPANY'S

TELEPHONIC SPECIALTIES.

LICENSED BY THE AMERICAN BELL TELEPHONE COMPANY.

MANUFACTURES AND FURNISHES

The Western Electric Standard and Multiple Switch-Boards.

THE TOLL STATION SWITCH-BOARD.

THE WILLIAMS SWITCH-BOARD.

THE NEW GILLILAND MAGNETO BELL.

THE WILLIAMS BELL.

Pole Changers, Generators, Lightning Arresters, Extension Bell Switches.

CABLES FOR USE UNDERGROUND, OVERHEAD AND UNDER WATER.

INSULATED WIRE, TELEPHONE CORDS, LINE WIRE AND SUPPLIES.

BATTERIES AND APPARATUS FOR ELECTRICAL MEASUREMENT.

Multiple Switch-Boards.

MANUFACTURED UNDER THE PATENTS OF

L. B. FIRMAN, C. E. SCRIBNER,
C. H. WILSON, and C. C. HASKINS,
M. G. KELLOGG.

Our Multiple Switch-Board is in use in :

BALTIMORE, COLUMBUS, DAYTON, INDIANAPOLIS, KANSAS CITY, LIVERPOOL (England), LONDON (England), MELBOURNE (Australia), MEMPHIS, MILWAUKEE, MINNEAPOLIS, NASHVILLE, NEW ORLEANS, PEORIA, TOLEDO, WASHINGTON.

No other Board so happily combines the three requisites of **Speed, Simplicity and Economy.**

Its use does away with the **repeating of orders,** either by word of mouth or by tickets.

One operator does all the work necessary in connecting and disconnecting two subscribers on both lines, and does it instantly without moving more than a step.

Gilliland Magneto Bell.

MANUFACTURED UNDER THE PATENTS OF

E. T. GILLILAND.

STRONG, WELL MADE AND DURABLE.

The revolving armature of the bells has Hard Steel Bearings, and the wire is Held Firmly and Protected from oil.

The Driving Gear has Positive Motion and is Noiseless.

The Telephone Switch has both Sliding and Anvil contacts, and is made extra strong so as to withstand severe use.

The Ringer is adjusted without opening the box.

The **New Gilliland Bell** has been before the telephonic public for over a year, and has met with the most pronounced favor everywhere. Every Manager should try it.

Patterson Cable.

Aerial, Subterranean and Submarine.

MANUFACTURED UNDER THE PATENTS OF

W. R. PATTERSON.

The wires of which these now well-known cables are composed are separately covered with several windings of cotton or jute, or both, saturated with paraffine and protected by a lead pipe.

The Insulation is of the highest possible degree and thus is a guarantee of the Permanence and Durability of the cable.

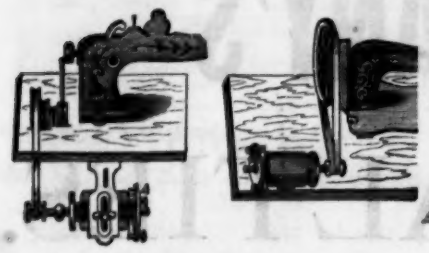
They contain in themselves no causes of change or deterioration.

Over 2,600 miles of conductors are in successful use.

Illustrated Catalogues and Price-Lists Mailed Free. Mention The Electrical World.

WESTERN ELECTRIC COMPANY,

CHICAGO. NEW YORK. BOSTON.



Motors, Dynamos, Automatic Batteries.

The Only Practical Electric Motors for Family Sewing Machines.

THE ELECTRO-DYNAMIC COMPANY,
224 Carter Street, Philadelphia, Pa.
SEND STAMP FOR CIRCULAR.

THE ANSONIA BRASS & COPPER CO.,

MANUFACTURERS OF

Pure Electric Copper Wire,

For Magnets, Telephones, Electric Lights, Etc.

With H. Splitdorf's Patented Liquid Insulation, covered with Cotton or Silk.

LINE WIRE.

Fire-Proof House and Office Wire for Indoor Use in Electric Lighting.
Wrought Metal Gongs, for Annunciators, Telephones, Etc. Zinc Rods, Battery Copper, Etc.

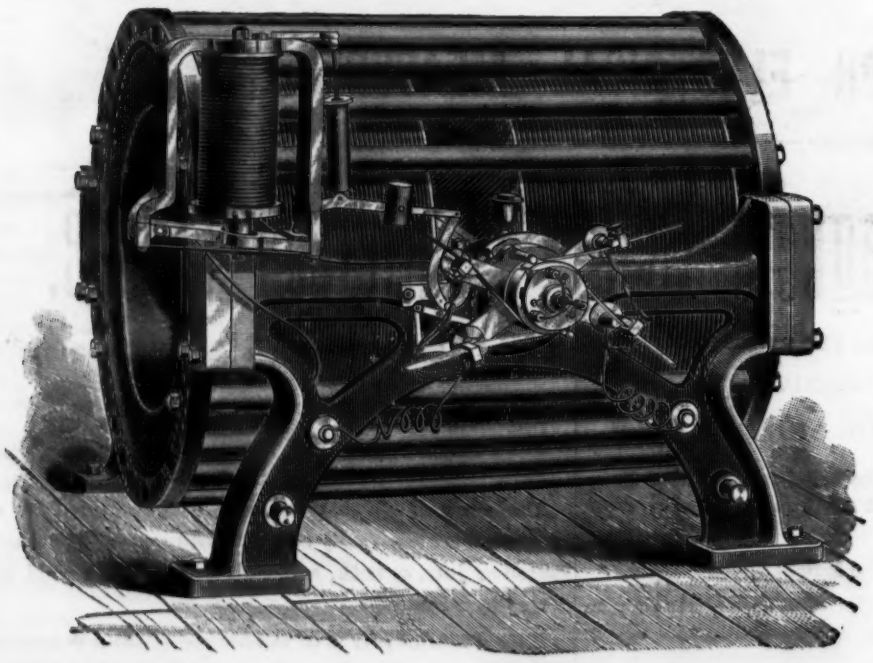
NOS. 19 & 21 CLIFF STREET, NEW YORK.

THE

Thomson-Houston Electric Co.

FURNISHES THE

ONLY PERFECT, AUTOMATIC, SELF-REGULATING SYSTEM OF ELECTRIC ARC-LIGHTING IN THE WORLD.



In all desirable qualities of Electric Arc Lights the **THOMSON-HOUSTON SYSTEM** has no equal. The lights are superior in color and steadiness, and the entire apparatus is more economical, efficient and safe, more easily managed, and less liable to derangement than any other.

The Thomson-Houston Electric Co. has been awarded the First Prizes for

The Best System of Arc Lighting and the Best Arc Lamp

at the Industrial Exposition in Cincinnati.

Principal Office, 131 Devonshire St., Boston, Mass.

New Illustrated Pamphlet will be sent on application.

Utica Fire Alarm Telegraph Co.

MANUFACTURERS OF

TELEPHONE EXCHANGE

SWITCH-BOARDS,

TELEPHONE AND TELEGRAPH

INSTRUMENTS & SUPPLIES

HOUSE, HOTEL AND BURGLAR ALARM ANNUNCIATORS,

Bells and Push Buttons.

Every Description of Electrical Apparatus in Stock.

PALMER'S

Universal Telephone Switch - Boards,

WITH PALMER'S PATENT SPRING JACKS, AND IMPROVED OPERATORS' LOOPING-IN-KEY.

The following are some of the Exchanges using this system :

Albany, N. Y.	Clinton, N. Y.	Amsterdam, N. Y.	Galveston, Tex.
Troy, N. Y.	Herkimer, N. Y.	West Troy, N. Y.	Houston, Tex.
Cleveland, O.	Little Falls, N. Y.	Cohoes, N. Y.	Little Rock, Ark.
Utica, N. Y.	Gloversville, N. Y.	Lansingburg, N. Y.	Canadian Exch'ges.

Mexican Tel. Co. Tropical American Tel. Co., and many others.

THE AHEARN

PATENT LIGHTNING ARRESTER.

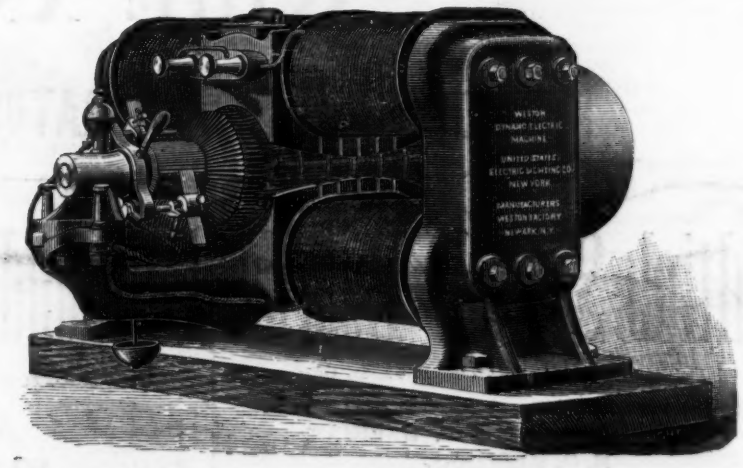
"THE ARRESTER THAT ARRESTS."

MANUFACTORY AND OFFICE,

106, 107 and 108 LIBERTY STREET, UTICA, N. Y.

CHARLES A. HOLFE, General Agent.

The United States Electric Lighting Co.,



MANUFACTURERS OF

Weston Dynamo Electric Machines,
Maxim Incandescent Lamps,
Weston Arc Lamps,

Automatic Regulators, Carbons, Electrical Fittings and Fixtures, Safety Devices, Steamship Projectors, Electric Motors, Electroplating Machines, Etc.

Office: 59 & 61 LIBERTY STREET, New York.

GEORGE W. HEBARD, President.
LEONARD E. CURTIS, Secretary.
PH. FERD. KOBBE, Treasurer.

TRUSTEES:

MARCELLUS HARTLEY,	EDWARD WESTON,	HENRY B. HYDE,
ANSON PHELPS STOKES,	WALTER T. HATCH,	JOHN A. STEWART,
CHARLES R. FLINT,	HENRY DAY,	ROBERT B. MINTURN,
LOUIS FITZGERALD.	GEORGE W. HEBARD,	LEONARD E. CURTIS.
	THOMAS H. HUBBARD.	